



YENEPOYA

(DEEMED TO BE UNIVERSITY)

Recognized under Sec 3(A) of the UGC Act 1956

Accredited by NAAC with 'A' Grade

YENEPOYA (DEEMED TO BE UNIVERSITY)

Deralakatte, Mangaluru -575018

REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

BACHELOR OF COMPUTER APPLICATION (BCA)

(BIG DATA ANALYTICS AND CLOUD COMPUTING)

(CURRICULUM - EFFECTIVE FROM 2019-20)

Structure of the program clearly indicating courses, credits/Electives

[Click Here](#)

ATTESTED

Dr.Gangadhara Somayaji K.S.
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Notification – 37-ACM/04/2019 dtd. 31.12.2019

Sub: Amendment in the syllabus for BCA (Big Data Analytics and Cloud Computing) course

Ref: Resolution of the Academic council at its 37th meeting held on 13.12.2019, vide agenda -12

The Academic Council at its 37th meeting and subsequently the Board of Management at its 48th meeting held on 13.12.2019 have accepted the proposal for amendments in the existing syllabus of BCA (Big Data Analytics and Cloud Computing) course as follows:

SEMESTER	COURSE CODE	EXISTING (SUBJECTS)	COURSE CODE	PROPOSED (SUBJECTS)
I	DC01BD-1C1	Programming Fundamentals using C++	FS01CA-1C1	Fundamentals of Information Technology
	DC01BD-1C2	Computer System Architecture	FS01CA -1C2	Same
	DC01BD-1A1 DC01BD-1A2 DC01BD-1A3	English Communication Hindi Kannada	FS01CA-1A1.1 FS01CA-1A1.2 FS01CA-1A1.3	Same
	DC01BD-1G1	Soft Skills	FS01CA- 1G1	Soft Skills
			FS01CA -1C3	Basic Mathematics & Statistics
II	DC01BD-2C1	Data Structures	FS01CA -2C1	Programming Fundamentals using C++
	DC01BD-2C2	Programming in Java	FS01CA -2C2	Data Base Management System
	DC01BD-2C3	Environmental Studies	FS01CA -2A1	Same
	DC01BD-2G1	Statistical Techniques with 'R'	FS01CA -2G1	Same
III	DC01BD-3C1	Data Base Management System	FS01CA -3C1	Data Warehousing and Mining
	DC01BD-3C2	Object Oriented Analysis	FS01CA -3C1	Data Structures
	DC01BD-3C3	Operating System and Computer Networks	FS01CA -3C1	Operating System
	DC01BD-3S1	Research Methodology	FS01CA -3S1	Same
	DC01BD-3G1	Web Application and Development	FS01CA -3G1	Same
	DC01BD-4C1	Software Engineering	FS01CA -4C1	Same
	DC01BD-4C2	Mobile Applications	FS01CA -4C2	Mobile Applications

IV		and Development Using Android		and Web Development
	DC01BD-4C3	Data warehousing and Mining	FS01CA -4C3	Programming in Java
	DC01BD-4S1	Entrepreneurship	FS01CA -4D1	Same
	DC01BD-4G1	Mini Project	FS01CA -4S1	Computer Networks
V	DC01BD-5C1	Foundation of Big Data System	FS01CA -5C1	Same
	DC01BD-5C2	Foundation of Data Analytics	FS01CA -5C2	Same
	DC01BD-5S1	Cloud Computing	FS01CA -5S1	Same
	DC01BD-5D1	Cryptography and Network Security	FS01CA -5D1	Cryptography and Network Security
	DC01BD-5D2	Programming Using Python	FS01CA -5D2	Same
			FS01CA -5S1	Seminar
VI	DC01BD-6C1	Big Data Analytics with Hadoop	FS01CA -6C1	Same
	DC01BD-6C2	Artificial Intelligence	FS01CA -6C2	Artificial Intelligence
	DC01BD-6S1	Industry Academia Interaction	FS01CA -6S1	Same
	DC01BD-6D1	Processing Real Time Big Data	FS01CA -6D1	Internet of things
	DC01BD-6D2	Project	FS01CA -6D2	Project

This is for implementation from the academic year 2020-21



REGISTRAR

To,

The Principal, YIASC

Copy to:

1. Controller of Examinations
2. File copy

BCA (Big Data Analytics and Cloud Computing)

The Bachelor of Computer Application degree is designed to provide students, who wants to make their career in the IT (Information Technology) field. The duration of the course is 3 years and divided into 6 semesters. It comprises of the subjects like database, networking, data structure, core programming languages like 'C' and 'java'.

The course provides a lot of opportunities to the students who are interested in computer field and wants to work in the IT sector as programmer or software developer. To get complete knowledge about the course and career scope, you can go through this article. This increasing growth of IT industry has created a lot of opportunities for the computer graduates. BCA course is often seen as a course equivalent to B.E. or B.Tech. in Computer Science.

The BCA programme that we offer comes in with an added benefit of Big Data Analytics and Cloud Computing which benefits the students in multiple ways. While Analytics play an important role in driving business strategy and making effective business decisions, Cloud Computing is a significant aspect of the information technology that has made lives of people easier and simpler. Cloud Computing refers to all the Internet-based services, applications and development. IBM defines Cloud Computing as 'computing as a service over the Internet' that allows storing of great volumes of data, sans the possibility of losing the same. Cloud Computing or 'the cloud' refers to pooling of technology resources for the delivery of centralized data storing and access services over the Internet.

Cloud Computing is a fast emerging business standard. Enterprises find it beneficial in several ways. Cloud Computing simplifies accessibility, provides virtual storage space, addresses backup issues, it provides security against unauthorized access and loss of data. Key advantage is that users can pay only for the resources they have used on 'the cloud' and do away with the major investments for data storage, software licenses, servers and hardware.

Information Technology is an area where the youngsters of India concentrate on. A degree in the subject may be awarded either by a university college dedicated to the studies of Computer Science with a relevant department. Degrees conferred in this academic field include MCA, MBA and PhD. Bachelor of Computer Applications is very popular academic degree in all over the world.

A combination of Computer Applications, Big Data Analytics and Cloud Computing are taking place in the degrees that we propose to offer. This sector is predicted to become the world's largest industry by the year 2020, generating enormous opportunities for well qualified individuals armed with credentials from an elite institute like Yenepoya University. These Graduates will be in great demand to assume exciting and rewarding positions anywhere in the World.

Programme Outcomes

Yenepoya University proposes to conduct BCA Big Data Analytics and Cloud Computing; programme with the following Goal

- To provide a strong foundation and understanding of the functioning of IT organizations, business organizations, commercial transactions and of various specialized operations such as accounting, finance and marketing by offering a comprehensive curriculum in data analytics and its applications in handling decisions.

- To provide a student comprehensive skills in data analytics to enable them to apply and implement the theoretical concepts of data science. The student would be able to perform data exploration, visualisation and hypothesis testing. The programme would enable students to identify practices of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Programme Specific Outcomes

To develop professional knowledge and skills in Computer system architecture, internet technologies, cloud computing, big data analytics, artificial intelligence, etc. by adopting learner centred pedagogical practices.

- To develop competency in students to pursue higher level programmes such as MCA, MBA, etc.
- To enhance employability and to be able to take up challenging job assignments related to complex IT technological solutions organisations.
- To develop the conceptual and practical skills of the students aimed at the intellectual pursuit of knowledge of Computer system architecture, internet technologies, cloud computing, big data analytics, artificial intelligence.
- To help understand methods and processes of information technology in every area of activity.
- To expose them to the areas of application of data analytics in business firms and industrial organizations.
- To enable them to acquire complete basic and intermediary practical knowledge of various computer technology related subjects related to data handling and decision making with the sole purpose of making them self-dependent and easily employable.

1. Duration of the Course:

The duration of the course shall be three years. Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year, the third and fourth semesters, and the third academic year as the fifth and sixth semesters.

2. Eligibility:

A candidate who has passed the two years Pre-University Examination conducted by the Pre-University Education Board in the State of Karnataka or any other examination considered as equivalent thereto by University is eligible for admission to these programmes.

3. Selection Process:

Application forms will be available in the official website of Yenepoya University (www.yenepoya.edu.in) and the college office for the applicants. A merit list will be prepared of selected candidates based on the 12th class marks /PUC marks. Reservation of seats will be followed as per the university Bye Laws.

4. Total Intake of Students: 140 students will be registered per year for the course.

5. Medium of Instruction: The medium of instruction and examination shall be English.

6. Attendance and Change of Subjects

A candidate shall be considered to have satisfied the requirement of attendance for a semester if he/she attends not less than 75% of the number of classes held in all subjects, including EC & CC. A candidate who does not satisfy the requirement of attendance in more than two subjects in a semester shall not be permitted to take the whole (all papers/subjects) University examination of that semester and he/she shall seek re-admission to that semester in a subsequent year and fulfil the attendance requirements of all subjects.

A student having an attendance shortage in any two subjects (whatever may be the credits or type e.g. Theory /practical) will not be allowed to write the examination of those two subjects, during that semester.

The student will enrol by paying a casual term fee of Rs. 7000/- per subject and will undertake remedial classes held during the semester vacation (either summer or winter) and fulfil the attendance requirement and take the examination when offered according to odd or even semester.

A student seeking readmission due to shortage of attendance in 3 subjects and more per semester will not be permitted to carry forward the tuition fee. The student will pay the entire tuition fee of the semester.

A student having the required attendance % in all subjects and fails to pass the subject in a semester is permitted to carry over all subjects and will attempt the exam as offered during the odd or even semester as a resit candidate

Whenever a change in a subject is permitted the attendance in the changed subject shall be calculated by taking into consideration the attendance in the previous subject studied by the candidate.

If a candidate represents his/her Institution/University/ Karnataka State/ Nation in Sports/ NSS/ Cultural or any officially sponsored activities he/she may be permitted to claim attendance for actual number of days participated, based on the recommendation of the Head of the Institution concerned. If a candidate is selected to participate in national level events such as Republic Day Parade etc., he/she may be permitted to claim attendance for actual number of days' participation based on the recommendation of the head of the Institution concerned.

7. Teaching Learning Methodology

The instructors will choose the pedagogy according to the course content and its applications from the methods provided below.

Lectures, Class discussions, reading assignments, Discussion groups. Lecture-demonstration, Student Presentation, Panel discussion by student panels from the class. Student reports by individuals, Student-group reports. Debate (informal) on current issues by students Forums Bulletin boards, Small groups such as task oriented, discussion, Textbook assignment. Reading assignments in journals, monographs, Assignment to outline portions of the textbook, Assignment to outline certain supplementary readings, Debates (formal). Crossword puzzles Maintaining Portfolios / Diaries. Reports on published research studies, Library research on topics or problems. Written book reports by students, Interviews, Audio-tutorial lessons, Open textbook study, Committee projects--small groups, Individual projects, Quiz, Use of dramatization, skits, plays (street plays), Student construction of diagrams, charts, or graphs, Making of posters by students, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching. Use of displays by instructor, Use of slides, Use of motion pictures, educational films, videotapes. Use of recordings (Ted Talks). Role playing, peer teaching. Coaching: special assistance provided for students having difficulty in the course. VIVA, filling out forms (income tax, checks). Visit an "ethnic" locations or commercial establishments or community. On the job training, specialize in other countries and in India Visit an employment agency. Campaigning, Volunteering, Prepare mock newspaper on specific topic or era, an entrepreneurial activity. Writing reports or project proposals.

The instructor would provide specific details of the methodology at the beginning of the course as applicable to each Unit, some teaching methods are -

Problem-based learning, learning tasks, discovery learning, computer simulation, Project work, direct instruction or lectures, models method, Programmed instructions, learning by teaching, Case study, learning at stations on PC and LAN network, Presentations through any applications.

Experiments, trials, Role play, Jigsaw and crosswords, concept mapping, Guidelines text methods, Web Quest, Reciprocal learning and portfolio methods.

8. Examination Structure for Written exam

Examination/Assessment	Marks
Internal Assessment	25
Final Examination	75
Total	100

9. Internal Assessment (IA)

Internal Assessment for each course, and details for each test are notified well in advance. IA consists of the following:

SN	Internal Assessment for 25 marks	Weightage
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/ Class Participation /Attitude	10
	Total	25

10. The marks of the internal assessment shall be published on the notice board of the college for information of the students.

11. Registration for Examinations

A candidate shall register for all the papers of a semester when he/she appears for the examination of that semester for the first time.

12. Conduct of Examinations

There shall be examinations at the end of each semester, ordinarily during November/December for odd semesters and during April/May for even semesters, as prescribed in the Scheme of Examinations.

13. Examination Scheme / Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	25 questions x 1 mark each	25 Marks
Section B	Short Answers or case	5 Questions x 5 marks each	25 Marks
Total			50 Marks

14. A) Examination Scheme / Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	25 questions x 1 mark each	25 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	5 Questions x 10 marks each	50 Marks
Total			75 Marks

B) Examination Scheme for

1	Constitution of India	MCQs
2	Human Rights, Gender Equity and Environmental Studies	MCQs
3	Intellectual Property Rights	MCQs
4	Environmental Studies	MCQs

C) Marks for N.S.S., Sports and Games, Other Co-Curricular, Extra-Curricular activities and students who have received meritorious awards will be considered as per UGC regulations.

D) Continuous Internal Assessment (CIA): Individual faculty will design the assessment for CIA. There will be no internal or final exam and the marks will be out of 100.

E)

Question paper pattern

Duration: 3 Hours

Max. Marks:75

Section A

Answer the following Questions

(1*25=25)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.
- 25.

Section B

Answer any FIVE of the Questions

(10 *5=50)

- 26.
- 27.
- 28.
- 29.
- 30.
- 31.
- 32.

15. Minimum for a Pass

No candidate shall be declared to have passed the Semester Examination (except in Co-curricular and extracurricular activities) unless he/she obtains not less than 40% marks in the aggregate of written examination and internal assessment put together in each of the subjects. There is no minimum mark in Internal Assessment, but Candidate should get minimum 40% in external examination. If a candidate fails in any subjects, he/she shall appear for that subject only at any subsequent regular examination, within the maximum 6 years from date of registration prescribed for completing the programme.

16. Evaluation/Challenge Evaluation

All theory examination papers will be evaluated by one examiner. There will a scope for revaluation of the papers, where the students can apply by submitting an application along with the necessary fee.

17. With Holding of Results

Results will be withheld when a student has not paid his/her dues or there is a case of disciplinary action pending against him/her.

18. Carry Over

A candidate who fails in a lower semester examination may go to the higher semester and take the examination.

19. Rejection of Results

A candidate may be permitted to reject the result of the whole examination of any semester. Rejection of result paper-wise/subject-wise shall not be permitted. A candidate who has rejected the result shall appear for the immediately following regular examination.

The rejection shall be exercised only once in each semester and the rejection once exercised cannot be revoked.

Application for rejection along with the payment of the prescribed fee shall be submitted together to the controller of examination of university through the College with the original statement of marks within 30 days from the date of publication of the result.

A candidate who rejects the result is eligible for only class and not for ranking.

20. Transfer of Admission

Transfer of admissions to other university is permissible only on mutual agreement with the other university. A candidate migrating from any other university may be permitted to join III/V Semester of the degree programme provided he/she has passed all the subjects of previous semesters/years as the case may be. Such candidates must satisfy all other conditions of eligibility stipulated in the regulations of Yenepoya University. Conditions for transfer of admission of students of other universities

He/she shall fulfil the attendance requirements as per the Yenepoya University Regulations.

His / Her transfer of admission shall be within the intake permitted to the college.

The candidate who is migrating from other universities is eligible for overall class and not for ranking. He / She shall complete the programme as per the regulation governing the maximum duration of completing the programme.

21. Grade Points - Choice Based Credit System (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses are evaluated following the grading system, which is considered to be better than the conventional marks system. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations is followed as per the UGC formulated guidelines. The CBCS syllabus is framed with not more than 20 % deviation. at the maximum

The papers are marked in a conventional way for 100 marks. The marks obtained are converted to a 10-point scale (if it is 50 marks paper 5point scale).

Grade Point = Actual Marks scored out of 100/10.

Range of Marks:

Absent	Below 4	4 - 4.49	4.5 - 4.99	5 - 5.99	6 - 6.99	7 - 7.99	8 - 8.99	9 - 10
0	0	4	5	6	7	8	9	10

Grade Point Weightage (GPW): Grade points of each paper multiplied by credits assigned to the subject.

GPW= Grade point X Credits

The Semester Grade Point Average (SGPA) - is the sum of the product of the credits with the grade points scored in all subjects divided by the total credits in the semester.

SGPA = Σ Credits x Grade Points / Total Credits

Minimum SGPA for a pass is 4.

If a student has not passed in a subject or is absent then the SGPA is not assigned.

The Cumulative Grade Point Average (CGPA) - is the weighted average of all the subjects undergone by a student over all the six semesters of a course.

CGPA = Σ Total credits in the semester x SGPA / Total credits of the course. SGPA and CGPA will be rounded off to two decimal places. Interpretation of SGPA/ CGPA/ Classification of final result for a UG course.

Grade Point and Class Description:

Letter Grade	Grade Point	Range of mark
O (Outstanding)	10	9.00-10
A+ (Excellent)	9	8.00 - 8.99
A (Very Good)	8	7.00 -7.99
B+ (Good)	7	6.00 - 6.99
B (Above Average)	6	5.00 - 5.99
C (Average)	5	4.50 - 4.99
P (Pass)	4	4.00 - 4.49
F (Fail)	0	Below 4
Ab (Absent)	0	0

22. Details of Course Structure and Assessment: BCA (Big Data Analytics and Cloud Computing)

Semester – I								
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
FS01CA-1C1	Fundamentals of Information Technology	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -1C2	Computer System Architecture	4	-	4	25	75	100	6
					-	-	100*	
FS01CA-1A1.1	English	2	-	-	25	75	100	2
FS01CA-1A1.2	Hindi							
FS01CA-1A1.3	Kannada							
FS01CA- 1G1	Soft Skills	2	-	-	25	75	100	2
FS01CA -1C3	Basic Mathematics & Statistics	4	-	-	25	75	100	4
	Total	16	-	8			700	20
Semester – II								
FS01CA -2C1	Programming Fundamentals using C++	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -2C2	Database Management System	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -2A1	Environmental Studies	2	-	-	25	75	100	2
FS01CA -2G1	Statistical Techniques with R	4	-	-	25	75	100	4
	Total	14		8			600	18
Semester – III								
FS01CA -3C1	Data Warehousing and Mining	4	-	-	25	75	100	4
FS01CA -3C1	Data Structures	4	-	-	25	75	100	4
FS01CA -3C1	Operating Systems	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -3S1	Research Methodology	2	-	-	25	75	100	2
FS01CA -3G1	Web Application and Development	4	-	4	25	75	100	6
					-	-	100*	
	Total	18	-	8			700	22
Semester – IV								
FS01CA -4C1	Software Engineering	4	-	-	25	75	100	4
FS01CA -4C2	Mobile Application and Web Development	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -4C3	Programming in Java	4	-	4	25	75	100	6

					-	-	100*	
FS01CA -4D1	Computer Networks	2	-	-	25	75	100	2
FS01CA -4S1	Entrepreneurship	2	-	-	25	75	100	2
	Total	16	-	8			700	20
Semester - V								
FS01CA -5C1	Foundation of Big Data System	6	-	-	25	75	100	6
FS01CA -5C2	Foundation of Data Analytics	6	-	-	25	75	100	6
FS01CA -5S1	Cloud Computing	2	-	-	25	75	100	2
FS01CA -5D1	Cryptography and Network Security	4	-	-	25	75	100	4
FS01CA -5D2	Programming Using Python	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -5S1	Seminar	-	2		-	-	100*	2
	Total	22	2	4			700	26
Semester – VI								
FS01CA -6C1	Big Data Analytics with Hadoop	4	-	4	25	75	100	6
					-	-	100*	
FS01CA -6C2	Artificial Intelligence	4	-	-	25	75	100	4
FS01CA -6S1	Industry Academia Interaction	2	-	-	25	75	100	2
FS01CA -6D1	Internet of Things	4	-	-	25	75	100	4
FS01CA -6D2	Project	2	2	4	-	-	100*	6
	Total	16	2	8			600	22
Grand total credits of (I,II,III,IV,V and VI Semester)							4000	128

*Continuous Internal Assessment (CIA) (100 marks)

*SWAYAM courses may be undertaken as choice for any of the four and two credit modules.

23. SWAYAM COURSE GUIDELINES (For Students) Minimum 8 credits and a maximum of 20 credits of MOOC credits is permitted.)

Guidelines for opting MOOC subjects as elective or open elective (Any of the 4 credit or 2 credit subjects) Core 6 credit courses are not electives.

1. At the time of selecting any Elective or Open Elective, student can opt for a MOOC subject of same credit or one credit less.

2. Process for opting MOOC subject by the student:

Student identifies a MOOC subject on SWAYAM portal (<https://swayam.gov.in>).

Student informs Departmental Swayam Coordinator (DSC) about it.

DSC gives the code of the subject to the student.

Students will apply online through SMS or mobile app.

After the process the student enrolls/registers in the subject on SWAYAM portal (<https://swayam.gov.in>).

Student will inform DSC after registering and enrolling on SWAYAM portal.

3. After the completion of the subject, a copy of the certificate of completion with the marks obtained is to be submitted to the DSC.

4. Credit Conversion:

If credit for MOOC subject taken by the student matches with the credit of Departmental elective or Open elective, then no conversion is needed and same breakup for CA (online assignments) and ESE (Proctored exam) will be taken.

Conversion of 3 credit MOOC subject to 4 credit subject or 2 credits MOOC subject to 3 credit subjects:

End Semester Exam (ESE) 50 Marks	Continuous Assessment (CA) 50 Marks			
	Proctored Exam (as per MOOC mark sheet scaled to 50)	Online Assignments (as per MOOC mark sheet)	Presentation 1 (to be conducted by departmental committee)	Presentation 2 (to be conducted by departmental committee)
Marks distribution	50	25	10	15
Marks required to Pass	ESE (out of 50) + Online assignment (out of 25) =30 marks		P1+P2=11 marks	

Goal: To impart the knowledge about the evolution of computers, classification, various peripherals of computers, types of softwares etc.

Objectives By the end of this course, a student will

- Identify various devices and their working principles.
- Define various computer applications.
- Develop programming languages.

Unit 1 Computer Basics and Architecture

Computer Basics: Introduction, Characteristics computers, Evolution computers, Generation of computers, Classification of computers, the computer system, Application of computers.

Computer Architecture: Introduction, Central processing Unit- ALU, Registers, Control Unit, system bus, main memory Unit, cache memory, communication between various Units of a computer system.

Components inside a computer system – System case, Power supply, Mother board, BIOS, Ports and Interfaces, Expansion card, Ribbon cable, Memory chips, Processors.

Unit 2 Computer memory and storage

Computer memory and storage: Introduction, memory representation, memory hierarchy, Random access memory, Types of RAM, Read-only memory, Types of ROM, RAM, ROM and CPU interaction.

Secondary Storage: Types of secondary storage device - Magnetic tape, magnetic disk, Floppy disk, Hard disk, Advantages and disadvantages of magnetic disk, Optical disk, Types- CD, DVD, Blu ray disk, Advantages and disadvantages of optical disk, Magneto-optical disk, Memory stick, , Universal serial bus, Mass storage devices.

Unit 3 Input devices and Output devices

Input devices: Introduction, Types of input devices, Keyboard, Mouse, Introduction to Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, weBCSm, flat bed scanner, Optical character recognition, Optical Mark Recognition, Magnetic ink character recognition, Bar code reader.

Output devices: Types of output, Classification of output devices, Printers- Dot matrix, drum printer, Ink jet, Laser, Hydra, Plotter, Monitor- CRT, Displaying graphics on CRT, Colour display on CRT, LCD, Differences between LCD and CRT, Other types of monitors, Voice response ,Projector, Electronic white board.

Unit 4 Computer programming languages

Introduction to Computer programming languages, Developing a program, Program development cycle, Types of programming languages, generation of programming languages, Features of a good programming language. Computer software: Introduction, software definition, relationship between software and hardware, software categories, Installing and uninstalling software, software piracy, software terminologies. Word processing software, Spreadsheet software: Excel environment, Copying cells using Fill handle, dragging cells, Formulas and functions, Inserting Charts, sorting.

Presentation software: Introduction, PowerPoint environment, creating a new presentation, working with different views, using masters, adding animation, adding transition, running slides. Microsoft Access: Access environment, Database objects.

Unit 5 Overview of Electronic Commerce

Main Activities, definition, Goal, Components, Advantages and disadvantages, Technical architecture, E-Com applications, E-Com and Electronic business. Network infrastructure: Evolution of the Internet, Business use, LAN, MAN, WANs. OSI Model: Introduction to OSI Model, Seven Layers, Overview of TCP/IP reference model.

Suggested Reading

- A K Sharma, Computer Fundamentals and Programming in C, Universities Press, 2nd edition, 2018
- Peter Norton, Introduction to Computers, 7th edition, Tata McGraw Hill Publication, 2011
- Anita Goel, Computer Fundamentals, Pearson Education, 2011.
- ITL Education Solution Limited, Introduction to Information Technology, Pearson-Second Edition.

Practical: Based on MS Office

(Total Hours 60)

1. Prepare a word document for inserting picture, bulleting, numbering, formatting, border shading.
2. Prepare document for word art, drop cap, columns, text box, symbols, equation of any mathematical series.
3. To create a resume.
4. Prepare a Power point presentation on a technical topic.
5. Create a student table with the following details : name, address, class attendance,
6. Create a EMPLOYEE data base having D.A.H.R A, income tax, Net Pay
D.A = 10% of basic pay
H.R.A – if basic pay is less than 25,000 H.R.A 10% of basic else H.R.A 25% of basic.
Gross= D.A+H.R.A+Basic Pay
Provident fund = 12% of basic pay.

FS01CA -1C2 – Computer System Architecture

(Total Hours 60)

Goal: This course will enable the students to conceptualize the basics of organizational and architectural issues of a digital computer. To analyze performance issues in processor and memory design of a digital computer. To understand various data transfer techniques in digital computer. To analyze processor performance improvement using instruction level parallelism

Objectives By the end of this course, a student will

- Understand basic structure of computer.
- Perform computer arithmetic operations.
- Control Unit operations.
- Design memory organization that uses banks for different word size operations.
- Explain the concept of cache mapping techniques.
- Describe the concept of I/O organization.
- Conceptualize instruction level parallelism.

Unit 1 Introduction

Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory Units.

Unit 2 Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

Unit 3 Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit 4 Central Processing Unit

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit 5 Memory Organization:

Cache memory - Associative memory - mapping.

Unit 6 Input-Output Organization

Input / Output: External Devices, I/O Units, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Suggested Reading

- M. Mano. (1992).Computer System Architecture, Pearson.

- A. J. Dos Reis (2004). Assembly Language and Computer Architecture using C++ and JAVA, Course Technology,
- W. Stallings. (2009). Computer Organization and Architecture Designing for Performance, 8th Ed., Prentice Hall of India.
- M.M. Mano. (2013). Digital Design, Pearson Education Asia.
- Carl Hamacher. (2012). Computer Organization, 5th Ed. McGraw Hill.

PRACTICAL:

(Total Hours 60)

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. General study of Basic & Universal gates
 - a) AND
 - b) OR
 - c) NOT
 - d) NOR
 - e) NAND
 - f) XOR
 - g) XNOR
2. Simple Boolean Expression using Basic gates and Universal gates: $A \cdot (B+A) + B \cdot A$
3. Design Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor Circuit.
4. Parallel Adder (2-bit, 3-bit) Circuit.
5. Implement logic functions in SOP form using Multiplexer.
6. Implement De-multiplexer.
7. Implement 7- Segment Display with Decoder.
8. Implement Parity Generator (Odd & Even)
9. Implement Magnitude Comparator (1-bit, 2-bit, 3-bit)
10. Circuit Design and implementation of Flip-Flops (SR, JK, D) using ICs
11. Circuit design and implementation of Decoder (2x4) and Encoder (4x2) using ICs

FS01CA-1A1.1 - English

(Total Hours 30)

Goal: Enable to read various types of texts independently, discuss them among peers and develop the ability to be well versed in English language.

Objectives: By the end of this course, a student will be able

- To master communication skills in English and speak the language with fluency and accuracy.
- To approach an issue from various points of view, and develop the habit of questioning varied views critically and objectively.
- To make academic presentations precisely, logically and effectively and master the skills of academic writing.
- To undertake journalistic activities like writing, editing and designing newspapers, video-graphing and anchoring news bulletins and television programmes, producing corporate films and documentaries.

Unit 1 Prose

- Toasted English R.K. Narayan
- The Need for Excellence Narayana Murthy

Unit 2 Grammar

- Precis writing
- Phonetics
- Correction of errors
- Comprehension
- Synonyms
- Antonyms
- Homonyms
- One-word substitutes
- Correction of spelling
- Email correspondence
- Memorandum, Agendas, Minutes of the meeting
- Essay writing
- Letter writing - Job Application with CV
- Movie Review
- Conversational Phraseology of the course

Suggested reading:

- David Green, Contemporary English Grammar: Structure and Composition, Macmillan, New Delhi, 2009.
- Raymond Murphy, Intermediate English Grammar, (Reference and Practice for South Asian Students) Cambridge University Press, 1994.
- A.J. Thomson and A.V. Martinet., A practical English Grammar, Oxford University Press, 1986.
- K.R. Sreenivasa Iyengar, *Indian Writing in English*: New Delhi, Sterling; 1984.
- A.K. Mehrotra, *A Concise History of Indian*: New Delhi, Permanent Literature English Black; 2008

FS01CA-1A1.3 Kannada

(Total Hours 30)

ಪಠ್ಯ ಭಾಗದ ಉದ್ದೇಶ

ನೈತಿಕ ನಿಯಮ ಮತ್ತು ಕಚೇರಿಗಳಲ್ಲಿ ವ್ಯವಹರಿಸುವುದಕ್ಕೆ ಸಂಬಂಧಪಟ್ಟ ಹಾಗೆ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಲಾಗಿದೆ. ಜಾಹೀರಾತಿನ ಬಗ್ಗೆ ಉಲ್ಲೇಖವಿದೆ.

ಘಟಕ 1 - ಗದ್ಯಭಾಗ

- 1) ಜಪಾನೀಯರ ಬಿಸಿನೆಸ್ ಸ್ಟೈಲ್, ಜಯದೇವ ಪ್ರಸಾದ್ ಮೊಳೆಯಾರ್, ಪ್ರಸಾರಾಂಗ, ಮಂಗಳಗಂಗೋತ್ರಿ.
- 2) ಕಿವುಡ ನಾಯಿಯಾದ ಪ್ರಸಂಗ, ಕುಂ. ವೀರಭದ್ರಪ್ಪ, ಪ್ರಸಾರಾಂಗ, ಮಂಗಳಗಂಗೋತ್ರಿ.

ಘಟಕ 2 - ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡ

- 1) ವ್ಯಾಪಾರಕನ್ನಡ, ಪತ್ರಗಳು - ನುಡಿ ವಾಣಿ, ಪ್ರಸಾರಾಂಗ, ಮಂಗಳಗಂಗೋತ್ರಿ.

ಘಟಕ 3 - ಆಡಳಿತ ಕನ್ನಡ

- 1) ಲೆಕ್ಕ ಶಾಸ್ತ್ರ
- 2) ವಾಣಿಜ್ಯ ಮತ್ತು ಲೇವಾದೇವಿ
- 3) ಸರಕಾರ
- 4) ವೃತ್ತಿಗಳು
- 5) ಕಾನೂನು - ಶಬ್ದ ಸಂಪತ್ತು - ಸಾತೇನಹಳ್ಳಿ ಮಲ್ಲಿಕಾರ್ಜುನ - ತನು ಮನ ಪ್ರಕಾಶನ

ಘಟಕ 4 - ಪ್ರಬಂಧ

- 1) ಪ್ರಬಂಧ ಮಾಲೆ - ಸಿ.ಎಸ್. ಸೇತೂಬಾಯಿ - ವಾಸನ್ ಪಬ್ಲಿಕೇಷನ್ಸ್
- 2) ಜಾಹೀರಾತು- ತೆಂಕಣಗಾಳಿ - ಪ್ರಸಾರಾಂಗ, ಮಂಗಳಗಂಗೋತ್ರಿ.

ಬೋಧನಾ ವಿಧಾನ

ಗದ್ಯ ಮತ್ತು ಪ್ರಬಂಧವನ್ನು ವಿಮರ್ಶಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಆಸಕ್ತಿಯನ್ನು ಉಂಟು ಮಾಡಿಸಿ ಅರ್ಥಮಾಡಿಸುವುದು. ಕೆಲವೊಂದು ವಿಷಯ ಪ್ರೋಜೆಕ್ಟ್ ಮೂಲಕ ಇನ್ನೂ ಸಮರ್ಪಕವಾಗಿ ತಿಳಿಸಿಕೊಡುವುದು. ಪ್ರಶ್ನೆ ಕೇಳುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ಜ್ಞಾನವನ್ನು ಪರೀಕ್ಷಿಸಿಕೊಳ್ಳುವುದು.

उद्देश

साहित्य से उभरनेवाला चिंतन हमें उन्नत स्तर पर ले जाता है जहाँ मनुष्य का कल्याण एवं समृद्धि मात्र भौतिक नरह कर उससे बड़े परिपेक्ष्य की ओर अग्रसर रहता है। इस उद्देश्य से गद्य और काव्य का रचना किया गया है। कोई भी मौलिक काव्य कवि—मानसका प्रतिरूप होता है, उसकी रचना चाहे जितनी अकस्मिकता के साथ हुई हो, वह अपने भी तरकवि के अन्तर्गत की पूरी झलकसँ जो ये रहता है, कवि न शम्बूक को 'हरिजन'की अपेक्षा 'भूमि-पुत्र'के रूप में शम्बूक ही नहीं सारे मनुष्य भूमि- पुत्र कहलाकर नयी सार्थकता पान के आधिकारी हैं, इसका व्यंजक यह भावक ईस्थलों पर व्यक्त हुआ है। कुछ कहानियों के द्वारा विद्यार्थियों की कल्पना शीलता, कि याशीलता को भीविक सित करने प्रयास किया गया है,

सीखनेका परिणाम

जीवन के लिए भाषा और भाषा के लिए व्याकरण महत्व पूर्ण है, इसमें व्याकरण भाग भी सम्मिलित किया गया है। जिससे विद्यार्थियों के व्याकरण संबंधी ज्ञान देनेके लिए प्रयास किया गया है।

Course Content

UNIT 1 -	लघुकाव्य		
	१. शम्बूक	-	जगदीशगुप्त
UNIT 2 -	कहानी		
	१. छोटाजादूगर	-	जयशंकरप्रसाद
	२. ईद का त्योहार	-	प्रेमचन्द
	३. भोलारामकाजीव	-	हरिशंकरपरसाई
	४. गैंग्रीन	-	अज्ञेय
UNIT 3 -	व्याकरण		
	१. संज्ञा	-	भेद
	२. सर्वनाम	-	भेद
	३. शब्द	-	विकारी-अविकारी
	४. लिंग	-	(अन्यलिंगरूपलिखना)
	५. वचन	-	(वचनबदलना)
UNIT 4 -	व्याकरण		
	१. क्रिया	-	भेद
	२. क्रियाविशेषण	-	भेद
	३. मुहावरे		
	४. पारिभाषिकशब्दावली	-	(फ्रञ्चपत्त्र= ष्छल)हिन्दीरूपलिखना
	५. हिन्दीमें अनुवाद		

संदर्भग्रथ :

- कन्नड भाषाके आधुनिककविकुवेंपुके 'शूद्र'— तपस्वीलेखकजगदीशगुप्त.
- शम्बूकलोकभारतीप्रकाशन—इलाहाबाद ०१
- हिन्दीकहानीकाइतिहास—डा. लालचन्द्रगुप्तमंगल, राधाकृष्णप्रकाशन
- शैक्षणिकव्याकरण—कृष्णाकुमारगोस्वामी, आलेखप्रकाशन, दिल्ली.
- उपन्यासकारप्रेमचंद—महेशभटनगर, नेशनलपब्लिशिंगहाउस, दिल्ली.

FS01CA- 1G1- Soft Skills

(Total Hours 30)

Goal: This course will enable the students to sharpen the Analytical, Written, non-verbal, Spoken Communication and interpersonal Skills essential in organizations involving Decision making and implementation, to demonstrate good team work and negotiation skills.

Objectives By the end of this course, a student will

- Hone the communication skills of the student to meet the changing and challenging demands of modern professional environment
- Reinforce presentation skills and professionalism
- Build a strong base for good interpersonal relationship and communication skills
- Create awareness about all areas of multiple intelligences

Unit 1 Communication in Business

Importance of Communication, Forms of Communication, Communication Network of the Organization; Process of Communication: Different Stages, Difference between Oral and Written Communication.

Oral Communication Skills

Fundamentals, Barriers and Gateways, Public Speaking, Effective Power point presentation, body language, non-verbal, facial expressions, voice modulation, eye contact, audience research, questions from the audience, communication and emotional intelligence, creativity in oral communication, Communication through Telephonic, video and Skype, Group Discussion.

Unit 2 Non Verbal and Inter Cultural Communication

Importance of non-verbal communication, personal appearance, facial expressions, movement, posture, gestures, eye contact –voice, beliefs and customs, worldview and attitude.

Written Communication Skills: Writing an Effective Report: Stages of Writing, Style and Tone; Five Ws and one H of Report Writing, Divisions, Numbering and use of Visual Aids, creativity in written communication, use of picture, diagram in written communication, Writing Commercial Letters, E- Mail Messages, maintaining a Diary, Job applications & resume writing.

Unit 3 Listening Skills

Importance and need, types, active and empathic listening, listening and judgment, developing skills, listening and understanding, Anatomy of poor Listening, Features of a good Listener

Communication in Business: Systems approach, forms, functions and principles of communication, management and communication, communication patterns, barriers to communication, interpersonal perception – SWOT analysis, Johari Window, Transactional Analysis.

Unit 4: Interpersonal Communication skills

Advantages and disadvantages of utilizing the team work; characteristic features of successful teams; stages of the development of a team; team roles; challenges in team working, forms of non-team behaviour. Conditions of negotiating; strategies of negotiating (win-win, win-loss); participative negotiations; negotiating tactics; cognition and emotions in negotiating; negotiating and ethics, Types and sources of conflicts; the influence of various cultures on the solving of conflicts.

Unit 5: Business Correspondence

Business letter, principles of business writing, memos -e-mails – agendas-minutes, sales letter, enquiries, orders, letters of complaint, claims and adjustments, notice and tenders, circulars, letters of application and résumé.

Business Proposals and Reports: Project proposals, characteristics and structure, Project reports – types, characteristics, structure, Appraisal reports – performance appraisal, product appraisal, Process and mechanics of report writing, visual aids, abstract, executive summary, recommendation writing, definition of terms.

Suggested Reading

- Monipally MM, “Business communication strategies”, McGraw Hill
- Bovee, Till and Schatzman, “Business Communication today”, Pearson Publishers
- Scot Ober, “Contemporary Business Communication”, Biztantra
- ParagDiwan, “Business Communication”, Excel Book
- Lesikar, R.V. & Flatley, M.E, “Basic Business Communication Skills for Empowering the Internet Generation”. Tata McGraw Hill Publishing Company Ltd
- Ludlow, R. & Panton, F, “The Essence of Effective Communications”. Prentice Hall of India Pvt. Ltd
- Chaturvedi P. D, & Mukesh Chaturvedi, “Business Communication : Concepts, Cases And Applications” –2/e, Pearson Education
- Murphy, “Effective Business Communication”, McGraw-hill

FS01CA -1C3 MATHEMATICS & STATISTICS

(Total Hours 60)

Goal: To impart the basic knowledge about the Mathematics and Statistics.

OBJECTIVES:

- To develop the skills of students in applying basic concepts in chosen topics of mathematics that are imperative for effective understanding of application oriented topics.
- To understand the basic concepts of matrices and know the importance of rank of matrix in data science.
- To know the importance of equation in data science models and its transformation.
- To understand the importance of differential calculus in estimation of linear models and to find the optimal values in minima and maxima.
- To know the basic concepts of integral calculus in statistical distribution functions.

Laying the foundation for learning concepts of Trigonometry and inverse functions

Unit 1: Set Theory

Sets and their representations; The empty set; finite and infinite sets; equal and equivalent sets; subsets; power set; universal set; Venn diagrams; complement of a set operations on sets; applications of sets.

Unit 2: Matrices and Determinants

Definition of a matrix; Operations on matrices; Square Matrix and its inverse; determinants; properties of determinants; the inverse of a matrix; solution of equations using matrices and determinants; solving equations using determinants.

Unit 3: Trigonometry

Radian or circular Measure; Trigonometric Functions; Trigonometrical ratios of angle θ when θ is acute; trigonometrical ratios of certain standard angles; allied angles; compound angles; multiple and sub- multiple angle. Limits and Continuity. The real number system; The concept of limit; concept of continuity.

Unit 4: Differentiation

Differentiation of powers of x ; Differentiation of e^x and $\log x$; differentiation of trigonometric functions; Rules for finding derivatives; Different types of differentiation; logarithmic differentiation; differentiation by substitution; differentiation of implicit functions; differentiation from parametric equation. Differentiation from first principles.

Unit 5: Integrations

Integration of standard Functions; rules of Integration; More formulas in integration; Definite integrals.

Probability

Concept of probability; sample space and events; three approaches of probability; kolmogorov's axiomatic approach to probability; conditional probability and independence of events; bay's theorem. Basics Statistics, Measures of central Tendency; Standard Deviation; Discrete series. Methods; Deviation taken from assumed mean; continuous series; combined standard deviation; coefficient of variation; variance.

SUGGESTED READING:

1. Narayanan, S. and Manicavachagom Pillay, T.K. (2015) Calculus Vol. I,II &III S.Viswanathan (Printers & publishers) Pvt. Ltd., Chennai.
2. Venkataraman, M.K., "Higher Mathematics for Engineering and Science", Third Edition, The National Publishing Co., Madras, 1986.
3. Kandasamy P, K. Thilagavathi and K. Gunavathy- Allied Mathematics Paper-I, First semester, 1/e, S. Chand & Co., New Delhi, 2003
4. Stewart J - Single Variable Calculus (4th edition) Brooks / Cole, Cenage Learning 2010.
5. Tom M. Apostol - Calculus, Vol. I (second edition) John Wiley and Sons, Inc., Jan 2007.
6. Burnside W.S. and A.W. Panton - The Theory of Equations, Dublin University Press, 1954.
7. MacDuffee, C.C. - Theory of Equations, John Wiley & Sons Inc., 1954.
8. Ushri Dutta, A.S.Muktibodh and S.D. Mohagaonkar: Algebra and Trigonometry, PHI India, 2006.

FS01CA -2C1 - Programming Fundamentals using C++

(Total Hours 60)

This course is aimed at enabling students to perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs. Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.

Goal: By the end of this course, a student will,

- Understand concepts of objects and their significance in real world
- Investigate software problem in terms of objects and entities
- Learn to co-relate relationship among different entities involved in a system
- Find dependency and roles in an environment
- Develop software in terms of objects, associations, and integrity constraints
- Generalize and aggregate business entities and transform behavior into functions
- Identify, understand and analyze various sample development models

Unit 1 Principles of OOP

Software Crisis – Software Evolution – Programming Paradigms. Object Oriented Technology- Basic concepts and benefits of OOP – Application of OOP, OOP Languages.

Introduction to C++: History of C++, Structure of C++, Application of C++, tokens, keywords, identifiers, basic data types, derived data types, derived data types, symbolic constant, dynamic initialization, Suggested Reading variables, scope resolution operator, type modifiers, type casting operators and control statements, input and output statements in C++, Function prototyping and components, Passing parameters: Call by reference, Return by reference, Inline function, Default arguments, Over loaded function.

Unit 2 Classes and Objects- Class specification, Member function definition – nested member function, access qualifiers, static data members and, member functions. Instance creation – Array of objects - Dynamic objects - Static Objects – Objects as arguments -Returning objects

Unit 3 Constructors and Destructors: Constructors- Parameterized constructors, Overloaded Constructors, Constructors with default arguments, copy constructors, Destructors.

Operator Overloading: Operator function-overloading unary and binary operators, overloading the operator using Friend function, Stream operator overloading, Data conversion.

Unit 4 Inheritance: Defining derived classes. Single Inheritance - Protected data with private inheritance - Multiple Inheritances - Multi Level Inheritance - Hierarchical Inheritance. Hybrid Inheritance - Constructors in derived and base Class -Abstract classes - Virtual function and Dynamic polymorphism -Virtual destructor - Nested Classes.

Unit 5 Functions in C++

Virtual functions- need for Virtual function, , Pure Virtual functions, Generic Programming with Templates. Introduction, function templates, overloaded function templates, user defined templates arguments, class templates, Inheritance of class templates.

Suggested Reading

- Thareja, Reema. (2015). Object Oriented Programming with C++. Oxford University Press
- Schildt, Herb. (2002). The Complete Suggested Reading C++. Tata McGraw-Hill, Fourth Edition.
- RbertoLafore, (2002). Object Oriented Programming in C++. 4th Ed. Galgotia Publication.
- Ashok N Kamathane. (2003). Object Oriented Programming with ANSI & Turbo C++, Pearson.
- BjarneStroustrup, (2001). C++ Programming language, Pearson.
- Venugopal K R, RajkumarBuyya and Ravishankar T. (2006). Mastering C++, TMH.
- E Balagurusamy, **Object Oriented Programming with C++**, 5th Edition, Tata McGraw hillPublication.

Practical:

(Total Hours 60)

Object Oriented Programming Using C++ LAB

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.
3. Write a C++program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.
4. Write a C++program to find the factorial of a given integer 5. Write a C++program to find the GCD of two given integers
5. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
6. Write a C++program to implement call by value and call by Suggested Reading parameters passing
7. Write a C++ program to implement function templates
8. Write a program to implement Overloading and Overriding
9. Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are:
 - a. Reading a matrix.
 - b. Printing a matrix
 - c. Addition of matrices
 - d. Subtraction of matrices
 - e. Multiplication of matrices
10. Write C++programs that illustrate how the Single inheritance, Multiple inheritance Multi level inheritance and Hierarchical inheritance forms of inheritance are supported.
11. Write a C++program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class

12. Write a C++ program that illustrates how run time polymorphism is achieved using virtual functions

Suggested Reading

- C++ common knowledge : essential intermediate programming/ C++ (Computer program language) , Dewhurst, Stephen C. Addison-Wesley, Upper Saddle River, N. J.: 2005.
- C++ programming : From Problem Analysis to Program Design / C plus plus programming. : Malik, D S. Course Technology, Boston, MA : c2009. Fourth Edition.
- C++ programming cookbook Herb Schildt's C++ programming cookbook / C++ (Computer program language) , Schildt, Herbert. McGraw-Hill, New York: c2008.
- Problem solving with C++ / Savitch, Walter J, 1943- Pearson/Addison-Wesley, Boston : c2006. Sixth Edition.
- Problem solving with C++: The object of programming/ C++ (Computer program language) . Savitch, Walter. Pearson Addison Wesley, Boston: 2005. Fifth Edition (International ed.)

FS01CA -2C2 Data Base Management System

(Total Hours 60)

Goal: This course will enable the students to understand and use a relational database system, to introduce the students to Databases, Conceptual design using ERD, Functional dependencies and Normalization, Relational Algebra is covered in detail. To learn how to design and create a good database and use various SQL operations.

Objectives By the end of this course, a student will

- Master the basic concepts and understand the applications of database systems.
- Construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
- Construct unary/binary/set/aggregate queries in Relational Algebra.
- Understand and apply database normalization principles.
- Construct SQL queries to perform CRUD operations on database. (Create, Retrieve, Update, Delete)
- Understand principles of database transaction management, database recovery, security.

Unit 1 Database Systems

Introducing the database and DBMS, Files and File Systems, Problems with file System and advantages of Database Management systems.

Data Models: The importance of Data models, Data Model Basic Building Blocks, Business Rules, The evaluation of Data Models, Degree of Data Abstraction.

Unit 2 The Relational Database Model

A logical view of Data, Keys, Integrity Rules, Relational Set Operators, The Data Dictionary and the system catalog, Relationships within the Relational Database, Data Redundancy revisited, Indexes, Codd's relational database rules.

Entity Relationship Model: The ER Model, Developing ER Diagram.

Unit 3 Normalization of database tables

Database Tables and Normalization, The need for Normalization, The Normal forms and High level Normal Forms, denormalization.

Unit 4 SQL

Introduction to SQL: Data Definition Commands, Data Manipulation Commands, Select queries, Advanced Data Definition Commands, Advanced Select queries, Virtual Tables, Joining Database Tables.

Advanced SQL: Relational Set Operators, SQL Join Operators, Subqueries and correlated queries, SQL Functions, Oracle Sequences, and Procedural SQL.

Unit 5 Transaction Management and Concurrency Control

What is transaction, Concurrency control, Concurrency control with locking Methods, Concurrency control with time stamping methods, concurrency control with optimistic methods, database recovery management.

Suggested Reading

- Peter Rob, Carlos Coronel. (2007). Database Systems Design, Implementation and Management, 7th Ed., Thomson
- Elimasri / Navathe. (2007). Fundamentals of Database Systems, 5th Ed., Pearson Addison Wesley
- Raman A Mata – Toledo/Panline K Cushman. (2007). Database Management Systems, Schaum's Outlibe Series, Tata McGraw Hill.
- C.J.Date, A.Kannan, S.Swamynathan. (2006). An Introduction to Database Systems, 8th Ed., Pearson Education.
- AtulKahate. (2006). Introduction to Database Management Systems, Pearson Education.

Practical

(Total Hours 60)

Database Management Systems Lab

1. Order Tracking Database

- The Order Tracking Database consists of the following defined six relation schemas.
- Employees(eno,ename,zip,hdate)
- Parts(pno,pname,qoh,price,level) (hint: qoh: quality on hand)
- Customers(cno,cname,street,zip,phone)
- Orders(ono,cno,eno,receiveddate,shipped date) Odetails(ono,pno,qty)
- Zipcodes(zip,city)

Solve the following:

1. Get all pairs of customer numbers for customers based on same zip code.
2. Get part numbers for parts that have been ordered by at least two different customers.
3. For each odetail row, get ono,pno,pname,qty and price values along with the total price for the item. (total price=price*qty)
4. Get customer name and employee pairs such that the customer with name has placed an order through the employee
5. Get customer names living in fort dodge or liberal.
6. Get cname values of customers who have ordered a product with pno 10506.
7. Get pname values of parts with the lowest price. 8. Get cname values of customers who have placed at least one order through the employee with number 1000.
8. Get the cities in which customers or employees are located.
9. Get the total sales in dollars on all orders.
10. Get part name values that cost more than the average cost of all parts.
11. Get part names of parts ordered by at least two different Customers.
12. Get for each part get pno, pname and total sales
13. For each part, get pno,pname, total sales, whose total sales exceeds 1000
14. Get pno, part names of parts ordered by at least two different customers.
15. Get cname values of customers who have ordered parts from any one employee based in wichita or liberal.

2. Shipment database

An enterprise wishes to maintain the details about his suppliers and other corresponding details.

For that it uses the following tables:

- Table s(sid,sname,address)
- primary key : sid
- Table p(pid,pname,color)
- primary key : pid
- Table cat(sid,pid,cost)
- primary key : sid+pid
- Suggested Readingkey : sidSuggested Readings.sid
- pidSuggested Readingp.pid

Solve the following:

1. Find the pnames of parts for which there is some supplier
2. Find the snames of suppliers who supply every part.
3. Find the snames of suppliers who supply every red part.
4. Find the pnames of parts supplied by london supplier and by no one else
5. Find the sids of suppliers who charge more for some part other than the average cost of that part
6. Using group by with having clause get the part numbers for all the parts supplied by more than one supplier.
7. Get the names of the suppliers, who do not supply part p2.
8. Find the sids of suppliers who supply a red and a green part
9. Find the sids of suppliers who supply a red or a green part
9. Find the total amount has to pay for that supplier by part located from london Employee Database: An enterprise wishes to maintain a database to automate its operations. Enterprise divided into to certain departments and each department consists of employees.

The following two tables:

- describes the automation schemas
- Dept (deptno, deptname, loc)

3. Emp (empno,ename,job,mgr,hiredate,sal,comm,deptno)

1. Create a view, which contain employee names and their manager names working in sales department.
2. Determine the names of employee, who earn more than their managers.
3. Determine the names of employees, who take highest salary in their departments.
4. Determine the employees, who located at the same place.
5. Determine the employees, whose total salary is like the minimum salary of any department.
6. Update the employee salary by 25%, whose experience is greater than 10 years.
7. Delete the employees, who completed 32 years of service.
8. Determine the minimum salary of an employee and his details, who join on the same date.
9. Determine the count of employees, who are taking commission and not taking Commission.
10. Determine the department does not contain any employees.
11. Find out the details of top 5 earner of company.
12. Display those managers name whose salary is more than average salary of his employees.
13. Display those employees who joined the company before 15th of the month?
14. Display the manager who is having maximum number of employees working under him?

15. Print a list of employees displaying 'less salary' if less than 1500 if exactly 1500 display as 'exact salary' and if greater than 1500 display 'more salary'?
16. Display those employees whose first 2 characters from hire date-last 2 characters of salary?
17. Display those employees whose 10% of salary is equal to the year of joining?
18. In which year did most people join the company? Display the year and number of employees.
19. Display the half of the enames in upper case and remaining lower case
20. Display ename, dname even if there no employees working in a particular department(useouter join).

4. Pl/sql programs

1. Write a pl/sql program to check the given number is strong or not.
2. Write a pl/sql program to check the given string is palindrome or not.
3. Write a pl/sql program to swap two numbers without using third variable.
4. Write a pl/sql program to generate multiplication tables for 2,4,6
5. Write a pl/sql program to display sum of even numbers and sum of odd numbers in the given range.
6. Write a pl/sql program to check the given number is pollinndrome or not.
7. write a pl/sql procedure to prepare an electricity bill by using following table
table used: elect
name null? Type
mno not null number
(3) cname varchar2(20)
cur_read number (5)
prev_read number (5)
no_Units number(5)
amount number(8,2)
ser_tax number(8,2)
net_amt number(9,2)
8. Write a procedure to update the salary of employee, who belongs to certain department with a certain percentage of raise.

FS01CA -2A1 Environmental Studies

(Total Hours 30)

Goal: This course will enable the students to understand and define terminology commonly used in environmental science; Briefly summarize and describe global, regional, and landscape scale environmental processes and systems; list common and adverse human impacts on biotic communities, soil, water, and air quality and suggest sustainable strategies to mitigate these impacts.

Objectives by the end of this course, a student will

- Possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
- Solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy.
- Read, critically evaluate presented information and data using scientific principles and concepts, synthesize popular media reports/articles discussing environmental issues, and verbally discuss and defend their Introduction to Environmental Science
- Apply learned information to postulated environmental scenarios to predict potential outcomes.

Unit 1 Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2 Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3 Natural Resources: Renewable and Non-renewable Resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4 Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5 Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Unit 6 Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 7: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8 Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification
- Study of simple ecosystems -pond, river, Delhi Ridge, etc.

Suggested Reading

- Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
- Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36-37.
- McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29-64). Zed Books.
- McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
- Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
- Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
- Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
- Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
- Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

FS01CA -2G1 Statistical Techniques with 'R

(Total Hours 60)

Goal: This course will enable the students to frame real life problems in appropriate statistical terms in order use data to make better decisions, to make sense of data along with the basics of regression analysis. Students will develop critical and integrative thinking in order to communicate the results of the analysis clearly in the context of the problem and unambiguously articulate the conclusions and limitations of the analysis with a clear separation between data and judgment.

Objectives By the end of this course, a student will

- Select appropriate statistical techniques for summarizing and displaying data
- Analyze and draw inferences from data using appropriate statistical methods.
- Analyze the dispersion in the data and draw inference.
- Define the concept of a frequency distribution for sample data, and be able to summarize the distribution by diagrams and statistics.
- Examine correlation and regression, and be able to make predictions and understand their limitations.

Unit 1 Classification, tabulation and graphical representation of data

Types of data, measurement of data, Classification of data, preparation of tables, stem and leaf display, presentation of data, frequency distribution, graphical representation.

Measure of central tendency: need, importance and Characteristics, Mean: Arithmetic mean, Geometric mean, Harmonic mean, weighted mean, Combined mean, Median, Mode of grouped and ungrouped data, quartiles, merits and demerits.

Unit 2 Measure of Dispersion

Need, importance and properties, range, interquartile deviation, quartile deviation, mean deviation, variance, standard deviation, coefficient of variation, combined variance of grouped and ungrouped data, merits and demerits.

Regression: scatter diagram, Simple linear regression, regression line x on y and y on x, regression coefficients, method of least squares to fit a regression line, properties of regression coefficient, multiple regression (2 independent variables), applications.

Unit 3 Correlation

Graphical representation, correlation coefficient, correlation of bi-variate data, relationship between correlation coefficient and regression coefficients, rank correlation, and problem of tied observations.

Unit 4 R Programming

Introducing R, The need for R, Installing R, RStudio; Basic Objects – Vector, Matrix, Array, Lists, Data frames, Functions. Managing Workspace: R's working directory, Inspecting the environment, Modifying global options Managing the library of packages; Basic Expressions: Assignment expressions, Conditional expressions, Loop expressions.

Working with Strings: Getting started with strings, Formatting date/time, using regular expressions.

Working with Data: Reading and writing data, Visualizing data, Analysing data

Unit 5 Inside R

Understanding lazy evaluation, the copy-on-modify mechanism, lexical scoping, how an environment works; Meta programming -functional programming; computing on language.

Data Manipulation: Using built-in functions to manipulate data frames, Using SQL to query data frames via the sqldf package, Using data. Table to manipulate data, Using dplyr pipelines to manipulate data frames, Using rlist to work with nested data structures; Profiling code, Boosting code performance

Suggested Reading

- Sheldon M Ross, “Probability and Statistics for engineers and scientists” 4th edition, 2009, Elsevier Publications
- Douglas C. Montgomery & George C. Runger, “Applied Statistics and Probability for Engineers”, 3rd edition, 2003, John Wiley & Sons
- Albright, Zappe, Winston, “Data analysis, Optimization and Simulation Modeling”, 4th edition, 2011, Cengage learning
- Ken Black, “Applied Business Statistics making better business decision”, 7th edition, 2013, Wiley Publishers
- SarabBoslaugh, Paul Andrew Watters, “Statistics in a nutshell”, 2008, Shroff publishers and distributors.
- Gupta , S; Kapoor V.K, “Fundamentals of mathematical Statistics”, 2012, Sulthan Chand and Sons.
- B L Agarwal, “Programmed Statistics”, 2nd edition, 2003, New Age International
- David Freedman, Robert Pisani, Roger Purves, “Statistics”, 4th edition, 2009, Viva books
- Thomas , Seemon, “Basic Statistics”, 2014, Narosa publishing house
- Rice , John A, “Mathematical Statistics and data Analysis”, 2014, Cengage learning India

FS01CA -3C1 Data Warehousing and Mining

(Total Hours 60)

Goal: This course will enable the students to understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling and identifying new trends and behaviours.

Objectives By the end of this course, a student will

- Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply pre-processing statistical methods for any given raw data
- Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes
- Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
- Select and apply proper data mining algorithms to build analytical applications.
- Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery.
- To develop and apply critical thinking, problem-solving, and decision-making skills.

Unit 1 Introduction

Introduction to Data Mining, Fundamentals of data mining, data mining functionalities, data and attribute types, statistical description of data.

Data Pre-processing:

Data cleaning, data integration, data reduction, data transformation and data discretization.

Unit 2 Data Warehousing

Basic concepts, data warehouse modeling data cube and OLAP, data warehouse design and implementation.

Unit 3 Data Mining

Mining Frequent Patterns and Associations: Basic methods, frequent Item set mining methods any two algorithms, pattern evaluation methods.

Unit 4 Classification

Basic concepts, decision tree induction, Bayes classification, any two advanced methods, model evaluation.

Unit 5 Cluster Analysis

Basic concepts, clustering structures, major clustering approaches, partitioning methods, hierarchical methods, density based methods, the expectation maximization method, cluster based outlier detection Essential Reading.

Suggested Reading

- VikramPudi, P.Radhakrishna. (2002). Data Mining. Oxford University Press
- ReemaThareja. (2010). Data Warehousing. Oxford University Press
- I.J. Han , M. Kamber and J. Pei. (2011). Data Mining: Concepts and Techniques, 3rd Ed. Morgan Kaufmann.
- G.K.Gupta. (2001). Introduction to Data Mining, PHI

FS01CA -3C1 Data Structures

(Total Hours 60)

Goal: The Goal for this course are to gain a solid understanding of the topics such as Principles for good program design, especially the uses of data abstraction and modular program composition. The fundamental design, analysis, and implementation of basic data structures and algorithms. Basic concepts in the specification and analysis of programs.

Objectives by the end of this course, a student will

- Differentiate primitive and non-primitive structures.
- Design and apply appropriate data structures for solving computing problems.
- Apply sorting and searching algorithms to the small and large data sets.

Unit 1 Data Structures Basics

Structure and Problem Solving, Data structures, Data structure Operations, Algorithm: complexity, Time- space trade-off.

Unit 2 Linked List

Introduction, Linked lists, Representation of linked lists in Memory, Traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list.

Unit 3 Stack and Queue

Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue.

Unit 4 Trees

Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.

Unit 5 Graphs

Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees.

Unit 6 Directed Graphs

Types of Directed Graphs; Binary Relation As a Digraph; Euler's Digraphs; Matrix Representation of Digraphs.

Unit 7 Applications of Graphs

Topological Sorting, Shortest-Path Algorithms – Weighted Shortest Paths – Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm, Introduction to NP-Completeness.

Unit 8 Searching and Sorting Techniques

Sorting Techniques: Bubble sort, Merge sort, Selection sort, Heap sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching, Search Trees.

Unit 9 Elementary Algorithms

Notation for Expressing Algorithms; Role and Notation for Comments; Example of an Algorithm; Problems and Instances; Characteristics of an Algorithm; Building Blocks of Algorithms; Procedure and Recursion – Procedure, Recursion; Outline of Algorithms; Specification Methods for Algorithms.

Unit 10 Mathematical Functions and Notations

Functions and Notations; Modular Arithmetic / Mod Function; Mathematical Expectation in Average Case Analysis; Efficiency of an Algorithm; Well Known Asymptotic Functions and Notations; Analysis of Algorithms – Simple Examples; Well Known Sorting Algorithms – Insertion sort, Bubble sort, Selection sort, Shell sort, Heap sort.

Unit 11 Divide and Conquer

Divide and Conquer Strategy; Binary Search; Max. And Min.; Merge sort; Quick sort.

Unit 12 Greedy Method

Greedy Method Strategy; Optimistic Storage on Tapes; Knapsack Problem; Job Sequencing with Deadlines; Optimal Merge Pattern; Single Source Shortlist Paths.

Unit 13 Dynamic Programming

Dynamic Programming Strategy; Multistage Graphs; All Pair Shortest Paths; Travelling Salesman Problems.

Unit 14 Backtracking Strategy

8-Queens Problem, Sum of Subsets, Knapsack Problem.

Suggested Reading

- Reddy. P. (1999). Systematic Approach to Data Structures Using C. Bangalore: Sri Nandi Publications
- Kamanthe A. N., Programming and Data Structures, South Asia: Dorling Kindersley (India) Publications
- Lipschutz. S. (2011). Data Structures with C. Delhi: Tata McGraw hill Reddy. P. (1999). Data Structures Using C. Bangalore: Sri Nandi Publications
- Samantha. D (2009). Classic Data Structures. New Delhi: PHI Learning Private Limited
- Weiss. M. (1996). Data Structures and Algorithm Analysis in C. Addison Wesley Publications
- [http://msdn.microsoft.com/en-us/library/ms379574\(v=vs.80\).aspx](http://msdn.microsoft.com/en-us/library/ms379574(v=vs.80).aspx)
- <http://cg.scs.carleton.ca/~luc/1997notes/topic11/>

FS01CA -3C1 Operating Systems

(Total Hours 60)

Goal: This course will enable the students to demonstrate skills in tracing, analyzing, and designing recursive algorithms and recursive methods; to explain programs that use scapegoat trees and also programs that use red–black trees; to analyze and implement different types of sorting algorithms.

Objectives by the end of this course, a student will

- Write programs using array-based lists; linked lists; skip lists; using binary trees and variations.
- Write code for hash tables, and compare and contrast various collision detection and avoidance techniques.
- Apply heaps to implement priority queues
- Implement data structures for graphs and approaches for searching graphs using breadth-first, depth-first, best-first search, etc.
- Analyze binary tree.

Operating System

Unit 1 Introduction

Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems, Operating System Structures, Components & Services, System calls, System programs, Virtual machines. Process Management: Process Concept, Process Scheduling, Co – Operating process, Threads, Inter process communication, CPU Scheduling Criteria, Scheduling algorithm, Multiple Processor Scheduling, Real time Scheduling, Algorithm evolution.

Unit 2 Process Synchronization and deadlocks

The Critical Section Problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors, Dead locks – system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock, Combined approach to deadlock handling.

Unit 3 Memory Management

Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging in Mastics and Intel 386, Virtual memory-Demand paging and it's performance, Page replacement algorithms, Allocation of frames, thrashing, page size and other considerations. Demand Segmentation.

Unit 4 File management (Systems, Secondary Storage Structure

File Concepts, Access methods, Directory Structure, Protection and consistency, File system structure, Allocation methods, Free space management, Directory Implementation, Efficiency and Performance, Recovery. Disk Management (Structure, Disk Scheduling Methods): Disk Structure & Scheduling methods, Disk management, Swap – Space management.

Unit 5 Protection and Security

Goal of protection, Domain Protection, Access matrix, Security Problem, Authentication, One-time password, program threats, System threads. Case Study of Windows and Linux Operating System.

Suggested Reading

- H.M.Deitel. (2003). Operating Systems, 3rd Ed. Pearson Learning Solutions.
- William Stallings. (2010). Operating Systems, 6th Ed., Pearson Education.
- Stuart. (2008). Operating systems: Principles, Design and Implementation, 1st Ed. Cengage Learning India
- Abraham Silberschatz and Peter Baer Galvin. (2012). Operating System Concepts, 7th Ed., Pearson.

- Comer. (2003). Computer Networks and Internets with Internet Applications, 4th Ed. Pearson Education.
- Stallings, William. (2000). Data and Computer Communication. 6th Ed. Pearson.

Practical:

(Total Hours 60)

PART-A

DATA STRUCTURES

1. Write a program to demonstrate binary search.
2. Write a program to demonstrate selection sort.
3. Write a program to demonstrate insertion sort.
4. Write a program to demonstrate merge sort.
5. Write a program to implement stack using array.
6. Write a program to implement queue using arrays.

PART-B

OPERATING SYSTEM

1. Write a shell script to accept 'n' integers and count +ves, -ves and zeroes respectively. Also find the sum of +ves and -ves.
2. Write a shell script to accept many characters and count individual vowels, digits, spaces, special characters and consonants.
3. Write a shell script to accept student name and marks in 3 subjects through command line arguments. Find the total marks and grade (depending on the total marks).
4. Write a menu driven shell script for the following
 - a) Rename a file (check for the existence of the source file).
 - b) Display the current working directory.
 - c) List the users logged in.
5. Write a shell script to accept many filenames through command line. Do the following for each filename
 - a) If it is an ordinary file, display its content and also check whether it has execute permission.
 - b) If it is a directory, display the number of files in it.
 - c) If the file/directory does not exist, display a message.
6. Write a menu driven shell script for the following

- a) Append the contents of a file to another file (Display the message if the file does not exist in the directory).
- b) List all file names/ directory names in the present working directory which has the specified pattern.
- c) Assign execute permission to a specified file for the owner and a group.

PART-C

DATA STRUCTURES

Write a program to evaluate postfix expression.

Write a program to implement circular queue using array.

Write a program to perform all operations on a singly linked list.

Write a program to implement stack using linked list.

Write a program to implement queue using linked list.

Write a program to perform inorder,preorder and postorder traversal of a binary tree.

FS01CA -3S1 Research Methodology

(Total Hours 30)

Goal: This course will enable the students to accumulate knowledge which are essential for gathering, analyzing and interpretation of the problems confronted by humanity; to understand the concepts relating to research, basic statistics and business; to study the nature of Social and Business research, and provides the techniques of research, identification of problem, research design, data collection, sampling, hypothesis, processing, and interpretation of data and preparation of reports.

Objectives By the end of this course, a student will

- Provide an overview of the research process
- Define the methods and techniques of research
- State clearly their research problem and associated research questions arising, including both descriptive and either explanatory or exploratory questions.
- Conduct a literature review of the concepts comprising the research questions
- Set out the main elements of a potential research instrument for testing the hypotheses,
- Distinguish between quantitative and qualitative approaches and methods
- Designing research report

Unit 1 Nature of Social and Business Research

Meaning and definition of research, Criteria of good research, social research-Goal, assumptions, deductive and inductive methods, significance and difficulties of Social research. Business research- Research and business decisions.

Unit 2 Methods and Techniques of Research.

Classification of research-According to the intent- Pure Research, Applied Research, Exploratory Research, Descriptive Study, Diagnostic Study, Evaluation Studies, and Action Research. According to the method- Experimental Research, Analytical Study, and Historical Research. Inter Disciplinary Research and its essentials.

Unit 3 Research Problem and Research Design.

Research Problem: Steps involved for selection of a topic for research study, components of research problem, Definition of Problem, Evaluation of Problem, review of relevant literature, sources of literature Note Taking. Testing of Hypothesis, Errors in Hypothesis, Research Design: - Meaning, definition, Classification of Research Designs. Importance of Research Plan, Contents of a Research Plan.

Unit 4 Sampling and Sample Design

Meaning of Sample, purpose of Sampling, Sampling Technique – Random Sampling and Non-random sampling, Errors in Sample Surveys – Sampling Errors and Non Sampling Errors.

Unit 5 Methods and Tools for Data collection.

Methods of Data Collection: Meaning and Importance of data, Sources of data – Primary Sources and Secondary Sources, Methods of collection of Primary and Secondary data. Tools or instruments of data collection: Observation schedule, Interview guide, Interview schedule, Mailed

questionnaire, Rating scale, Check list, Opinionated, Document Schedule. Types of Questions– open ended/close ended, Measurement scale–Meaning and types

Unit 6 Processing, Analysis and Interpretations of Data and Report writing.

Steps in data processing, editing, coding, classification, transcription, analysis of data, interpretation. Use of Excel in Data Entry & Analysis- Variable types- Frequency tables – Various Kinds of Charts and Diagrams Used and their Significance.

Report Writing: Introduction, types of report, planning of report-writing, format of research report. Documentation: Foot notes and Bibliography, briefing and evaluation of report-writing.

Suggested Reading

1. Krishnaswami, O.R (2012).Research Methodology. Mumbai: Himalaya publishing House.
2. Bhandarkar, W. T. (2006).Methodology and Techniques of Social Research.Mumbai: HimalayaPublishing House.
3. Krishnaswami, O. (2012).Research Methodology.Mumbai: Himalaya publishing House.
4. C.N Kothari.Research Methodology/3rdedn: New Age International Pvt Ltd; New Delhi
5. Pannerselvam.R. (2006).Research Methodology. New Delhi: Prentice Hall of India.
6. Trochim, M.K. (2009).Research Methods.New Delhi: Sultan Chand.

FS01CA -3G1 Web Application and Development

(Total Hours 60)

Goal: This course will enable the students to produce dynamic, animated, interactive and database driven web sites to prepare students for internet marketing and web site administration. Students will learn different languages like HTML5, CSS, JavaScript and PHP (Server-Side Programming; Students will work with different technologies and software components like web browsers, web servers (Apache) and database connectivity's.

Objectives by the end of this course, a student will

- Develop websites and web-based projects.
- Be employed on entry-level jobs of PHP based web development in software industry.
- Develop interactive and dynamic website.

Unit 1 HTML 5

Difference between HTML 4 & 5, Page Structure of HTML5. Section Tag & Article Tag; Adding figure and sidebar; Outlining in HTML5; using audio Element; Video Tag Attributes. HTML5 Forms Tags, search, tel, url and email; date/time input types, color number, range, min, max, and step attributes. Form Attributes, autocomplete, novalidate. Form Field Attributes, required, placeholder.

HTML5 Canvas; Drawing Lines; Multiple Sub-Paths; The Path Drawing Process. The fill () Method; Color and Transparency; Rectangles. Circles, Arcs and Curves.

Unit 2: CSS

Introduction to CSS, CSS Rules, Pseudo classes and pseudo elements, Selectors, Precedence of Selectors; Cascading; Creating an Embedded Style Sheet; Creating an External Style Sheet; Adding Inline Styles; Using CSS box model for spacing, borders, and backgrounds; Using CSS for page layout; Dealing with fonts, text, images and hyperlinks; Using Lists as Hierarchical Navigation. Styling Forms with CSS.

Drawback of CSS; Difference between SASS and LESS; Installation of LESS; Using LESS, Variables, Mixins, Cascading + Nesting, &combinatory, Operations, Comments, @import, String interpolation, Escaping, Pre-compile, Post-compile , LESS Elements.

Unit 3: jQuery UI

Overview of jQuery; UsingjQuery Selectors and Filters; Selecting Single and Multiple Elements. Operating on Wrapped Sets; Method Chaining; Accessing Attributes of an Element; Adding and Removing Elements; Setting up JQueryUI; JQueryUI Interactions, JQueryUI Widgets, JQueryUI Effects.

Unit 4: PHP Basics

Introduction to PHP; Embedding PHP code inside HTML; Working with Types and operators; Integer division, Generating Random numbers; Comparing values with the Spaceship operator; Condition and Looping statements; Arrays, Numeric Associative and Multi-dimensional arrays; Strings and String functions; Regular Expressions; Date and Time function; Mathematical functions; User-Defined Functions; Return type declarations with compound Types; Scalar Type Hinting; Scalar Parameter and Return Type declarations; Working with web forms; PHP POST &

GET form elements; Validating form data; Understanding magic quotes; Setting default values in forms; Handling Errors, Throwing and Catching Exceptions. Logging exceptions.

Unit 5: PHP Intermediate

Classes and Objects Constructors and Destructors Access Specifiers, Static and final modifiers Inheritance and its types Polymorphism, Abstract and Final classes. Anonymous Classes, Generator Return expressions, Generator Delegation. Using MySQL; Database Basics, Configuring PHP for Database Support, Managing Database Connections, PHP's Database & SQL APIs, Performing Queries, Processing Result Sets, PDO. PHP cookie handling; PHP session handling; Reading & writing; files with PHP; Processing uploaded files; Retrieving uploaded files; Mail functions

Suggested Reading

- Kogent Learning, “HTML 5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and jQuery”, 1st Edition, 2011, Tata McGraw Hill Publishers.
- Christopher Murphey, R Clark, “Beginning HTML 5 and CSS 3”, 1st Ed, 2015, Wiley Apress.
- M Rochkind, “Expert PHP and MySQL: Application Design and Development”, 2013, Apress
- Likas White, “Practical Laravel 5”, 1st Edition, 2014, Wiley Apress
- Simon Sarris, “HTML5 Unleashed”, 1st Edition, 2013, Sams Publishing.
- PiotrSikora, “Professional CSS3”, 1st Edition, 2014, Packt Publishing Limited.
- Alex Libby, “Instant LESS CSS Preprocessor How-to”, 1st Ed, 2015, Packt Publishing Limited.
- Eric Sarrion, “JqueryUi”, 2nd Edition, 2013, Orelly Publishers
- Joel Murach, Mike Murach, “Murach's PHP and MySQL”, 2nd Edition, 2012, Wiley India
- Adam Freeman , “Pro jQuery”, 1st Edition, 2013, Wiley Apress International.
- Steve Prettyman , “Learn PHP 7. Object-Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL”, 2nd Edition, 2014, Wiley Apress.
- BartozPorebski, “Building PHP Applications”, 1st Edition, 2014, Wiley Wrox Publishers
- Andrew Curisao, “Expert PHP and My SQL”, 1st Edition, 2014, Wiley Wrox Publications

HTML

1. Create a table in HTML with Person's Details
2. Create a registration form using HTML form input elements viz. textbox, text area, radio button- and drop-down menu, check box, submit, file and reset button. Field should contain name, address, birth-date, qualification, email, phone number, gender, comments, attach photo etc. Use HTML Form elements wherever required. Align all elements using table.
3. Create a HTML programs using frames. Three frames displaying three different HTML files.
 - i. Frame 01 – contain examples of ordered as well as unordered list
 - ii. Frame 02 – contain examples of text formatting tags i.e. , <i>, <u>, <h1>--<h6>, <p>, <sup> and <sub>
 - iii. Frame 03 – contain example of 3 by 4 table with data.
 - Iv. Create a hyperlink in Frame 01 that opens in Frame 03

B. CSS

- Create a horizontal navigation bar in DIV using external CSS which contain home, about, gallery, enquiry, contacts menus. Also create the same bar in vertical alignment in another DIV in same page.
- Create a following layout using CSS and display it in html file with proper border, background color, margin, border and padding.

C. PHP

- Create a PHP program in which two values submitted using form and calculate its addition, subtraction, multiplication, modulation, average and division on the same page. Find the greatest number between them and square of each of them using PHP function.
- Write following program in PHP:
 - i. Validating given email address
 - ii. Change background color based on hour of a day.
 - iii. Print Fibonacci Series.

D. JavaScript

- Write a Java script program to create a simple calculator.
- Write following Java script program:
 - i. Create form validation program that checks the empty values from that form and alert back using alert function. Use at least 5 components.
 - ii. Display a live clock in Java script.

E. PHP MYSQL Admin

- Create feedback form in PHP which contains first name, last name, address, email, comment and mobile number and store that information in database. Also create a page which displays submitted feedbacks in tabular form.
- Create a login form using session handling in PHP. After successful login display name, address and other details in tabular format of logged user. Create 5 users. Also create a 'Logout' option. Store the data of user, login and password in the database.
- Create a simple address book in PHP using MySQL database which contains Adding new person with address (name, phone number, email, permanent address and temporary address etc.), updating their address, deleting him from record and view all records in table.

F. Java Servlets

- Create two textboxes on the HTML page named login and password. After clicking on
 - i. the 'login' button the servlet will be displayed. It will show 'login successful' upon correct password else 'authentication failure' will be displayed. Make the use of HTTP Servlet or Generic Servlet.
 - ii. Write a program to demonstrate the use of servlet request and response as well as do Get () and do Post() methods. (The subject teacher should provide the appropriate problem statement for this).

FS01CA -4C1 Software Engineering

(Total Hours 60)

Goal: This course will familiarize the students with the systematic approaches to software development and maintenance. Software engineering meets this requirement. The student shall be able to take up a software projects and plan, develop and estimate its cost.

Objectives by the end of this course, a student will

- Plan and deliver an effective software engineering process, based on development lifecycle models.
- Translate a requirements specification into an implementable design, a structured and organised process.
- Make effective use of UML, along with design strategies such as defining a software architecture, separation of concerns and design patterns.
- Formulate a testing strategy for a software system, employing techniques such as Unit testing, test driven development and functional testing.
- Evaluate the quality of the requirements, analysis and design work done during the module.

Unit 1 Introduction

Software, Software Engineering: Definition; Phases in Software Engineering, , Key Challenges in Software Engineering.

Software Process Life Cycle

Software Process, Project and Product; Process Assessment; Software Life cycle models; Selection criteria of Software Process Models; Organization Process.

Unit 2 Software Requirements

Software Requirement, Feasibility Study, Requirements Elicitation; Requirement Analysis; Analysis Patterns; Requirements Specification; Requirements Validation; Requirements Management; Requirements Engineering Tools;

Software Design:Basics of Software Design; Data Design; Architectural Design; Component-Level design; User Interface Design; Pattern-Based Software Design; Developing a Collaborative Design; Software Design Notation; Software Design Reviews, Software Design Documentation; Case Studies

Unit 3 Software Coding

Features of a Software code; Coding Guidelines, Coding Methodology; Programming Practices, Code Verification Techniques, Coding Tools, Code Documentation

Software Testing : Software Testing Basics, Test Plan, Test Case Design, Software Testing Strategies, V Model of Software Testing, Levels of Software Testing; Testing Techniques; Object-oriented Testing; Software Testing Tools; Debugging; Software Test Report(STR), Case Studies

Unit4: Software Maintenance

Software Maintenance; Types of Software Maintenance; Software Maintenance Life Cycle; Software Maintenance Models; Techniques for Maintenance; Tools for Software Maintenance; Technology Change Management (TCM); Software Maintenance Documentation.

Software Quality: Quality Concepts; Software Quality Assurance Group; SQA Activities; Software Reviews; Evaluation Quality; CMM; TQM; Software Reliability.

Unit 5 Software Metrics

Software Measurement; Software Metrics; Designing Software Metrics; Classification of Software Metrics; Process Metrics; Product Metrics; Project Metrics; Measuring Software Quality; Object-Oriented Metrics

Software Planning & Scheduling: Project Planning; Project Scheduling; Project staffing; People Capability Maturity Model; Risk Management.

Suggested Reading.

- K.K. Aggarwal & Yogesh Singh, “Software Engineering”, 3rd Edition, New Age International
- Kelkar, “Software Engineering”, 1st Edition, 2010, Prentice Hall of India Ltd
- I. Sommerville, “Software Engineering ”, 10th Edition, 2013, Pearson.
- Ali Behforooz, F J Hudson, “Software Engineering Fundamentals”, 1st Ed, 2008, Oxford University Press.
- James Peter, W Pedrycz, “Software Engineering”, 4th Edition, 2011, Wiley India
- R. Fairley, “Software Engineering Concepts”, 1st Ed, 2009, Tata McGraw Hill,
- Stephen R. Schach, “Classical & Object Oriented Software Engineering”, 2nd Ed, 2007, Wiley
- RohithKurana, “Software Engineering Principles and Practices”, 3rd Edition, 2011, Vikas Publishers
- R. S. Pressman, “Software Engineering – A practitioner’s approach”, 7th Ed, 2012, McGraw Hill Int. Ed.,.
- Jawdekar, “Software Engineering”, 3rd Edition, 2011, Tata McGraw-Hill Publications

FS01CA -4C2 Mobile Application and Web Development

(Total Hours 60)

Goal: This course will familiarize the students to define mobile computing and the types of mobile devices; to understand the development environments, Architectures and programming paradigms of Windows, Android and iOS devices. &to understand user interface design considerations; to exploit the many capabilities of modern mobile devices to produce creative solutions to everyday challenges.

Objectives By the end of this course, a student will

- Understand the existing state of mobile app development via researching existing apps, meeting with industry professionals, and formulating new ideas.
- Display proficiency in coding on a mobile programming platform.
- Understand the limitations and features of developing for mobile devices.
- Create a complete Mobile app with a significant programming component, involving the sensors and hardware features of the phone.
- Develop mobile applications using modern mobile development tools for either the Android.
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and particularly sensing.

Unit 1 :Overview of Mobile Devices

Mobile devices vs. desktop devices - ARM and Intel architectures - Development environments; XCodeEclipseVisual Studio- Native vs. Web Applications.Comparing and Contrasting architectures of – Android, iOS and Windows - Underlying OS (Darwin vs. Linux vs. Win 8) - Kernel structure and native level programming - Runtime (Objective-C vs. Dalvik vs. WinRT)

Unit 2Android

An Open Platform for Mobile Development: Introduction to Android - Architecture - Features of Android SDK - Introducing the Development Framework, Developing for Android- Android Development Tools- The Android Virtual Device Manager - Android SDK Manager - The Android Emulator - The Dalvik Debug Monitor Service - The Android Debug Bridge. Installing and Configuring Android SDK, ADT and AVD - Android Software Stack, Dalvik Virtual Machine.

Unit3: Creating Android Applications

Working of Android Application: Android Application Life Cycle; Building User Interfaces - Introducing Activities, Activity Life Cycle, Various Layouts, Fragments, and Adapters. Intents, Intent Filter and Broadcast Receivers; Controls, Dialogs.

Toasts and Notifications: Using Basic Views, Picker Views, List Views and Specialized Fragments; Displaying Pictures and Menus with Views; Adding Interactivity and Handling UI events like Click, Key, Touch and Multi Touch

Unit 4: Saving Application Data

Creating, Saving and Retrieving Shared Preferences; Introducing the P SuggestedReadingsFramework and the P SuggestedReadingsActivity; Including Static Files as Resources; Working with the File System.

Data Access in Android: Introducing Android Databases; Introducing SQLite; Content Values and Cursors; Working with SQLite Databases; Creating and Using Content Providers; Using Native Android Content Providers.

Unit5: Advanced Android

Introducing Services, Using Background Threads, Using Alarms; Controlling Device Vibration; Introducing Android Text-to-Speech; Using Sensors and the Sensor Manager; Using Accelerometer, Compass and GPS; Audio, Video and Using the Camera; Using Telephony and SMS.

Suggested Reading

- Wallace B. McClure Nathan Blevins John J. Croft Iv Jonathan Dick Chris Hardy, “Professional Android Programming With Mono For Android And .Net/C# “, 1st Ed, 2012, Wiley Wrox
- Jeff Fiesen, “Learn Java For Android Development”, 1st Ed, 2010, Wiley Apress
- James C, “Android Application Development for Java Programmers”, 1st Ed, 2012, Cengage
- Ian f Darwin, “Android CookBook”, 1st Edition, 2012, O’Reilly Publishers.
- J F Demarizio, “Android: A Programmers Guide”, 2010, Tata McGraw Hill
- Chris Haseman, “Android Essentials”, 1st Ed, 2012, Wiley Apress
- ZigurdMednieks, Rick Rogers, L John, Blake Meike, “Android Application development’, O’Reilly
- Wallace Jackson, “Android Apps for Absolute Beginners”, 1st Ed, 2011, Wiley Apress
- Milette Stroud, “Professional Android Sensor Programming”, 1st Ed, 2012, Wiley Wrox
- Daniel sauter, “Rapid Android Application Development”, 1st Ed, 2013, Pragmatic Publishers.
- B M Harwani, "Android programming Unleashed", 1st Edition, 2013, Pearson Sams Series
- RetoMeirer, “Professional Android 4 Application Development”, 1st Ed, 2012, Wiley Wrox
- MacLean, KanakalaKomatineni, “Expert Android”, 1st Ed, 2013, Wiley Apress

Practical:

(Total Hours 60)

1. Program for developing an Android Application using a linear layout.
2. Program for developing an Android Application using a Relative layout.
3. Program for developing an Android Application using a Table layout
4. Program for developing an Android Application using an Absolute layout.
5. Program for developing an Android Application using a Frame layout.

FS01CA -4C3 Programming in Java

(Total Hours 60)

Goal: This course will enable the students to familiarize with hands-on course, students will gain extensive experience with Java and its object-oriented features. Students will learn to create robust console and GUI applications and store and retrieve data from relational databases.

Objectives By the end of this course, a student will

- Write, compile and execute Java programs
- Build robust applications using Java's object-oriented features
- Create robust applications using Java class libraries
- Develop platform-independent GUIs
- Read and write data using Java streams
- Retrieve data from a relational database with JDBC.

Unit 1 Introduction to Java

Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

Unit 2 Arrays, Strings and I/O

Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit 3 Object-Oriented Programming Overview

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Unit 4 Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

Unit 5 Exception Handling, Threading, Networking and Database Connectivity

Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using

java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Unit 6 Applets and Event Handling

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Suggested Reading

- Ken Arnold, James Gosling, David Homes. (2005). The Java Programming Language, 4th Ed.
- James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley. (2014). The Java Language Specification, Java SE8th Ed. (Java Series), Addison Wesley.
- Joshua Bloch. (2008). Effective Java 2nd Ed. Addison-Wesley.
- Cay S. Horstmann, GaryCornell. (2012). Core Java 2 Volume 1 ,9thEd. Prentice Hall.
- Cay S. Horstmann, Gary Cornell. (2013). Core Java 2 Volume 2 – (Advanced Features), 9th Ed., Printice Hall.
- Bruce Eckel. (2002). Thinking in Java, 3rd Ed. PHI.
- E. Balaguruswamy (2009). Programming with Java, 4th Ed. McGraw Hill.
- Paul Deitel, Harvey Deitel. (2011). Java: How to Program, 10th Ed. Prentice Hall,
- Bert Bates, Kathy Sierra. (2005). Head First Java, Orielly Media Inc. 2nd Ed.
- Eck, David J. (2009). Introduction to Programming Using Java, Create Space Independent Publishing Platform.
- Hubbard, John R. (2004). Programming with JAVA,Schaum's Series, 2nd Ed.

Practical

(Total Hours 60)

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and String Buffer class like set Char At (setLength(), append(), insert(), concat()and equals()).
9. Write a program to create a —distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer.
10. Modify the —distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as Suggested Reading variable to another object Suggested Reading variable. Further create a third object which is a clone of the first object.

11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by Suggested Reading and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacci series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program —Divide By Zero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URL Connection using the openConnection() method and then use it examine the different components of the URL and content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applets window.
26. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

FS01CA -4D1 Computer Networks

(Total Hours 30)

Goal: This course is to familiarize the students with computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

Objectives By the end of this course, a student will

- Define the architectural principles of computer networking and compare different approaches to organising networks.
- Explain key networking protocols and their hierarchical relationship in the context of a conceptual model such as the OSI and TCP/IP framework.
- Identify core networking and infrastructure components and the roles they serve.

Unit 1 Network Architecture

Network architecture – layers – Physical links – Channel access on links – Hybrid multiple access techniques - Issues in the data link layer - Framing – Error correction and detection –Link-level Flow Control.

Unit 2 Connections

Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges and switches.

Unit 3 Networks

Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP –DHCP – ICMP – Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting – CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer.

Unit 4 Retransmission

UDP – TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – QoS.

Unit 5 HTTP

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP – SSH.

Suggested Reading

- Andrew S. Tanenbaum. (2003). Computer Networks, 4th Ed.
- Trivedi, Bhushan. (2012). Computer Networks. Oxford University Press
- James F. Kuross, Keith W. Ross. (2004). Computer Networking, A Top-Down Approach Featuring the Internet, 3rd Ed. Addison Wesley
- Nader F. Mir. (2007). Computer and Communication Networks, Pearson Education.

FS01CA -4S1Entrepreneurship

(Total Hours 30)

Goal: This course will enable the students to understand the basic concepts in the area of entrepreneurship and the role and importance of entrepreneurship for economic development, developing personal creativity and entrepreneurial initiative. Students will adopt the key steps in the elaboration of business idea and understanding the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

Objectives By the end of this course, a student will

- Define basic terms
- Analyse the business environment in order to identify business opportunities
- Identify the elements of success of entrepreneurial ventures
- Consider the legal and financial conditions for starting a business venture
- Evaluate the effectiveness of different entrepreneurial strategies
- Specify the basic performance indicators of entrepreneurial activity
- Explain the importance of marketing and management in small businesses venture
- Interpret own business plan.

Unit 1 Introduction

Meaning, elements, determinants and importance of entrepreneurship and creative behaviour; Entrepreneurship and creative response to the society' problems and at work; Dimensions of entrepreneurship: intrapreneurship, technopreneurship, cultural entrepreneurship, international entrepreneurship, netpreneurship, ecopreneurship and social entrepreneurship

Unit 2 Entrepreneurship and Micro, Small and Medium Enterprises:

Concept of business groups and role of business houses and family business in India; The contemporary role models in Indian business: their values, business philosophy and behavioural orientations; Conflict in family business and its resolution

Unit 3 Public and private system of stimulation

Support and sustainability of entrepreneurship. Requirement, availability and access to finance, marketing assistance, technology, and industrial accommodation, Role of industries/entrepreneur's associations and self-help groups, The concept, role and functions of business incubators, angel investors, venture capital and private equity fund.

Unit 4 Sources of business ideas and tests of feasibility

Significance of writing the business plan/ project proposal; Contents of business plan/ project proposal; Designing business processes, location, layout, operation, planning & control; preparation of project report (various aspects of the project report such as size of investment, nature of product, market potential may be covered); Project submission/ presentation and appraisal thereof by external agencies, such as financial/non-financial institutions.

Unit 5 Mobilising Resources

Mobilising resources for start-up. Accommodation and utilities; Preliminary contracts with the vendors, suppliers, bankers, principal customers; Contract management: Basic start-up problems.

Suggested Reading

- Kuratko and Rao, *Entrepreneurship: A South Asian Perspective*, Cengage Learning.
- Robert Hisrich, Michael Peters, Dean Shepherd, *Entrepreneurship*, McGraw-Hill Education
- Desai, Vasant. *Dynamics of Entrepreneurial Development and Management*. Mumbai, Himalaya Publishing House.
- Dollinger, Mare J. *Entrepreneurship: Strategies and Resources*. Illinois, Irwin.
- Holt, David H. *Entrepreneurship: New Venture Creation*. Prentice-Hall of India, New Delhi.
- Plsek, Paul E. *Creativity, Innovation and Quality*. (Eastern Economic Edition), New Delhi: Prentice-Hall of India. ISBN-81-203-1690-8.
- Singh, Nagendra P. *Emerging Trends in Entrepreneurship Development*. New Delhi: ASEED.
- S.S Khanka, *Entrepreneurial Development*, S. Chand & Co, Delhi.
- K Ramachandran, *Entrepreneurship Development*, McGraw-Hill Education
- SIDBI Reports on Small Scale Industries Sector.
- Dr. G.K. Varshney, *Fundamentals of Entrepreneurship*, SahityaBhawan Publications.

FS01CA -5C1 Foundation of Big Data System

(Total Hours 90)

Goal: This course will familiarize the students to learn to analyze the big data using intelligent techniques; to understand the applications using Map Reduce Concepts; to introduce programming tools PIG & HIVE in Hadoop ecosystem.

Objectives By the end of this course, a student will

- Gain knowledge about various search methods and visualization techniques.
- Use various techniques for mining data stream
- Use programming tools PIG & HIVE in Hadoop ecosystem.

Unit 1 Introduction to big data

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

Unit 2 Mining data streams

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

Unit 3 Hadoop

History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce FeaturesHadoop environment. Frameworks: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams.

Unit 4 Analytics

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

Suggested Reading

- Michael Berthold, David J. Hand. (2007). Intelligent Data Analysis, Springer.
- Tom White. (2012). Hadoop: The Definitive Guide, 3rd Ed. O'reilly Media.
- Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing.
- AnandRajaraman and Jeffrey David Ullman. (2012). Mining of Massive Datasets, CUP.
- Bill Franks. (2012). Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons.
- Glenn J. Myatt. (2007). Making Sense of Data, John Wiley & Sons.
- Pete Warden. (2011). Big Data Glossary, O'Reilly.

- Jiawei Han, MichelineKamber. (2008). “Data Mining Concepts and Techniques”, 2 nd Edition, Elsevier, Reprinted 2008.
- Da Ruan, Guoqing Chen, Etienne E.Kerre, Geert Wets. (2007). Intelligent Data Mining, Springer.
- Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan. (2012). Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications.
- ArshdeepBahga, Vijay Madiseti. (2016). Big Data Science & Analytics: A Hands On Approach, VPT.
- Bart Baesens. (2014). Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series), John Wiley & Sons.

FS01CA -5C2 – Foundation of Data Analytics

(Total Hours 90)

Goal: This course will enable the students to explore several fundamental topics in computational data analysis, including background knowledge of probability and linear algebra, linear regression, dimension reduction, gradient descent, clustering and classification.

Objectives By the end of this course, a student will

- Gain knowledge of optimizing business decisions and creating competitive advantage with Data analytics
- Explore the fundamental concepts of big data analytics.

Unit 1 Introduction

Introduction to Analytics, Probability Review: sample space, random variables, independence, PDFs, CDFs, expectation, variance, joint and marginal distributions; Bayes Rule: Bayesian reasoning;

Unit 2 Convergence and Regression

Convergence: central limit theorem, probably approximately correct; Linear Algebra Review: vectors, matrices, multiplication, norms, linear independence, rank, inverse, orthogonality, numpy; Regression: multiple regression, linear regression, polynomial regression, overfitting and cross-validation;

Unit 3 Gradient Descent

Gradient Descent: functions, convexity, minimum, maximum, gradients, gradient descent, stochastic gradient descent, fitting a model to data; Dimension Deduction: SVD, rank-k approximation, eigenvalues, eigenvectors, power method, centering, PCA, M\Multidimensional Scaling;

Unit 4 Clustering

Voronoi diagrams, k-means, EM, mixture of Gaussian, mean-shift; Classification: linear prediction, Perceptron algorithm, kernels and SVM, neural nets.

Suggested Reading

- Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, (2014). Practical Data Science Cookbook, Packt Publishing Ltd.,
- Nathan Yau. (2011). Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics. Wiley.
- Boris Iublinky, Kevin t. Smith, Alexey Yakubovich, (2015). Professional Hadoop Solutions, Wiley.
- http://www.johndcook.com/R_language_for_programmers.html
- <http://bigdatauniversity.com/>
- <http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction>

FS01CA -5S1 Cloud Computing

(Total Hours 30)

Goal: This course will enable the students to familiarize with cloud services, cloud management, cloud virtualization technologies and to understand cloud services and solutions. Students will know about cloud virtualization technologies and cloud management and will understand the relevance of Cloud, SOA and benchmarks.

Objectives By the end of this course, a student will

- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing
- Apply the fundamental concepts in datacentres to understand the tradeoffs in power, efficiency and cost
- Discuss system virtualization and outline its role in enabling the cloud computing system model
- Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS
- Analyze various cloud programming models and apply them to solve problems on the cloud.

Unit 1 Introduction

Introduction, Essentials, Benefits, Business and IT Perspective, Cloud and Virtualization, Cloud Services Requirements, Cloud and Dynamic Infrastructure, Cloud Computing Characteristics, Cloud Adoption.

Cloud Models: Cloud Characteristics, Measured Service, Cloud Models, Security in a Public Cloud, Public versus Private Clouds, Cloud Infrastructure Self Service.

Unit 2 Cloud Services and Solutions

Gamut of Cloud Solutions, Principal Technologies, Cloud Strategy, Cloud Design and Implementation using SOA, Conceptual Cloud Model, Cloud Service Defined.

Cloud Solutions: Introduction, Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management, Cloud Stack, Computing on Demand (CoD), Cloud sourcing.

Unit 3 Cloud Offerings and Cloud Management

Cloud Offerings, Information Storage, Retrieval, Archive and Protection, Cloud Analytics, Testing under Cloud, Information Security, Virtual Desktop Infrastructure, Storage Cloud.

Cloud Management: Resiliency, Provisioning, Asset Management, Cloud Governance, High Availability and Disaster Recovery, Charging Models, Usage Reporting, Billing and Metering

Unit 4 Cloud Virtualization Technology

Virtualization Defined, Virtualization Benefits, Server Virtualization, Virtualization for x86 Architecture, Hypervisor Management Software, Logical Partitioning (LPAR), VIO Server,

Virtual Infrastructure Requirements, Storage virtualization, Storage Area Networks, Network-Attached storage, Cloud Server Virtualization, Virtualized Data Center.

Unit 5 Cloud Computing Web Services

Google Web service, Surveying the Google application portfolio, Google toolkit, Amazon web services, Components and services, EC2- Storage systems, Database services, Microsoft cloud services, Windows azure platform, Windows live.

Cloud Infrastructure: Managing the cloud, Administrating the cloud, Management products, communicating with the cloud, Instant messaging, Collaboration technologies, Social networks, Media and streaming.

Suggested Reading

- RajkumarBuyya, Christian Vecchiola and ThamariSelvi S, “Mastering in Cloud Computing”, 1st Edition, 2013, McGraw Hill Education Michael Miller, “Cloud Computing”, 1st Edition, 2012, Pearson Education.
- Kris Jamsa, “Cloud Computing”, 1st Edition, 2013, Jones & Bartlett Publishers
- Anthony T Velte, “Cloud Computing: A practical Approach”, 1st Ed, 2010, Tata McGraw Hill.
- Fern Halper, Kaufman, Bloor Robin, Hurwit, “Cloud Computing for Dummies”, 1st Ed, 2010, Wiley
- Pethuru Raj, “Cloud Enterprise Architecture”, 1st Edition, 2012, CRC Press
- Rittinghouse, Ransome, “Cloud Computing: Implementation, Mgmt& Security”, 1stEd, 2012, CRC Press
- VenkataJosyulla, Malcoom Orr, Greg Page, “Cloud Computing”, 1st Ed, 2010, Pearson
- George Reese, “Cloud Application Architectures: Building Applications andInfrastructure in the Cloud (Theory in Practice)”, 1st Edition, 2009, O’Reilly Publishers
- Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online”, 2nd Ed, 2008, Que Publishing.
- Barrie Sosinsky, “Cloud Computing Bible”, 1st Edition, 2011, Wiley Publishing.
- John Rhoton, “Cloud Computing Explained: Implementation Handbook forEnterprises”, 2nd Edition, 2013, Recursive Press, (CRC Press)
- Kumar Saurabh, “Cloud Computing: Insights into New-Era Infrastructure”, 1st Ed, 2011, Wiley India.

FS01CA -5D1 Cryptography and Network Security

(Total Hours 60)

Goal: This course will provide students with a practical and theoretical knowledge of cryptography and network security. Students will understand the fundamental principles of access control models and techniques, authentication and secure system design. Students will have a strong understanding of different cryptographic protocols and techniques and be able to use them.

Objectives By the end of this course, a student will

- Apply methods for authentication, access control, intrusion detection and prevention.
- Identify and mitigate software security vulnerabilities in existing systems.

Unit 1 Introduction

Security Goal, Cryptographic Attacks, Services and Mechanism, Techniques. Mathematics of Cryptography: Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence.

Unit 2 Transformations

Traditional Symmetric-Key Ciphers: Introduction, Substitution Ciphers, Transpositional Ciphers, Stream and Block Ciphers. Data Encryption Standard (DES): Introduction, DES Structure, DES Analysis, Security of DES, Multiple DES, Examples of Block Ciphers influenced by DES. Advanced Encryption Standard: Introduction, Transformations, Key Expansion, The AES Ciphers, Examples, Analysis of AES.

Unit 3 Cryptography

Encipherment using Modern Symmetric-Key Ciphers: Use of Modern Block Ciphers, Use of Stream Ciphers, Other Issues. Mathematics of Asymmetric-Key Cryptography: Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm. Asymmetric Key Cryptography: Introduction, RSA Cryptosystem, Rabin Cryptosystem, Elgamal Cryptosystem, Elliptic Curve Cryptosystems.

Unit 4 Functions

Cryptography Hash Functions: Introduction, Description of MD Hash Family, Whirlpool, SHA-512. Digital Signature: Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Schemes, Variations and Applications. Key Management: Symmetric-Key Distribution, Kerberos, Symmetric-Key Agreement, Public-Key Distribution, Hijacking.

Unit 5 Network Security

Security at the Application Layer: PGP and S/MIME: Email, PGP, S/MIME. Security at the Transport Layer: SSL and TLS: SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security. Security at the Network Layer: IPsec: Two modes, Two security protocols, Security association, security policy, Internet Key exchange, ISAKMP.

Suggested Reading

- Michael E. Whitman and Herbert J. Mattord. (2012). Principles of Information Security, 2nd Ed., Thomson, Cengage Delmar Learning.
- William Stalling. (2012). Network Security Essentials: Applications and Standards, 4th Ed., Pearson Education.
- Behrouz A. Forouzan, Debdeep Mukhopadhyay. (2011). Cryptography and Network Security, 2nd Ed., Special Indian Edition, Tata McGraw-Hill.

FS01CA -5D2 Programming using Python

(Total Hours 60)

Goal: This course will enable the students to familiarize with the fundamentals of computers and to learn how to install Python, start the Python shell, to perform basic calculations, print text on the screen and create lists, and perform simple control flow operations using if statements and for loops; will learn how to reuse code with functions.

Objectives By the end of this course, a student will

- Apply Python syntax and semantics and be fluent in the use Python flow control and functions.
- Create and run Python Programs using Lists, Dictionaries and handle File Systems.
- Define the concepts of Regular Expressions and Object-Oriented programming as used in Python.
- Build Data Structures using Python.
- Analyze the Network Programming and Web Services in Python.

Unit 1 Planning the Computer Program

Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Unit 2 Techniques of Problem Solving

Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Unit 3 Overview of Programming

Structure of a Python Program, Elements of Python.

Unit 4 Introduction to Python

Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

Unit 5 Creating Python Programs

Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments.

Suggested Reading:

- T. Budd. (2011). Exploring Python, TMH.
- Python Tutorial/Documentation www.python.org 2015
- Allen Downey, Jeffrey Elkner, Chris Meyers. (2012). How to think like a computer Scientist: learning with Python, Freely available online.2012

- <http://docs.python.org/3/tutorial/index.html>
- <http://interactivepython.org/courselib/static/pythonds>
- <http://www.ibiblio.org/g2swap/byteofpython/read/>
- LjubomirPerkovic, “Introduction to Computing Using Python: An Application DevelopmentFocus”, John Wiley & Sons, 2012

Practical

(Total Hours 60)

Software Lab Based on Python:

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon users choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
 - a. Grade A: Percentage ≥ 80
 - b. Grade B: Percentage ≥ 70 and < 80
 - c. Grade C: Percentage ≥ 60 and < 70
 - d. Grade D: Percentage ≥ 40 and < 60
 - e. Grade E: Percentage < 40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input paramters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to implement the use of arrays in Python.
7. WAP to implement String Manipulation in python in Python.
8. WAP to find sum of the following series for n terms: $1 - 2/2! + 3/3! - \dots - n/n!$
9. WAP to calculate the sum and product of two compatible matrices.

Section: B (OOPs using Python):

All the programs should be written using user defined functions, wherever possible.

1. WAP to create Class and Objects in Python.
2. WAP to implement Data Hiding in Python.
3. WAP to implement constructor and destructor for a class in Python.
4. WAP to implement constructor and destructor in Python.
5. WAP to implement different types of inheritance in Python.
6. WAP to implement concept of Overriding in Python.
7. Write programs to create mathematical 3D objects using class.
 - a. curve b. sphere c. cone d. arrow e. ring f. cylinder

List of Exercises

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:
Grade A: Percentage ≥ 80
Grade B: Percentage ≥ 70 and < 80
Grade C: Percentage ≥ 60 and < 70
Grade D: Percentage ≥ 40 and < 60
Grade E: Percentage < 40
3. Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Program to display the first n terms of Fibonacci series.
5. Program to find factorial of the given number.
6. Program to find sum of the following series for n terms: $1 - 2/2! + 3/3! - \dots - n/n!$
7. Program to calculate the sum and product of two compatible matrices.
8. Program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula $m=60/(t+2)$, where t is the time in hours. Sketch a graph for t vs. m, where $t \geq 0$.
9. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:
$$P(t) = (15000(1+t))/(15 + e^t)$$
where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.
10. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
 - I. velocity wrt time ($v=u+at$)
 - II. distance wrt time ($s=u*t+0.5*a*t*t$)
 - III. distance wrt velocity ($s=(v*v-u*u)/2*a$)

FS01CA -5S1 Seminar

(Total Hours 30)

The seminar presentations will take place at the end of the course. A suitable schedule will be worked out. Each student will present a summary of a scientific publication to the other students (and a teacher) in the form of a seminar. Each student will get a 10 + 5-minute timeslot: 10 minutes for seminar presentation and 5 minutes for questions from the audience. After a presentation, persons in the audience who want to ask questions about the seminar should attract the attention of the chairperson who will or will not (depending on how much time is available) grant the right to ask a question. Remember that questions should be asked in a polite manner, and should be about the scientific content (not the presentation technique).

FS01CA -6C1 Big Data Analytics with Hadoop

(Total Hours 60)

Goal: This course will familiarize the students with business decision making and create competitive advantage with Big Data analytics and to explore the fundamental concepts of big data analytics.

Objectives By the end of this course, a student will

- Use business intelligence and analytics, which include the use of data, statistical and quantitative analysis, exploratory and predictive models, and evidence-based methods to inform business decisions and actions.
- Select data mining techniques to business decision-making situations.

Unit 1 Introduction to Big Data Business Analytics

State of the practice in analytics role of data scientists - Key roles for successful analytic project
Main phases of life cycle - Developing core deliverables for stakeholders; Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

Unit 2 Introduction to Streams Concepts

Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

Unit 3 History of Hadoop

Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features; Hadoop environment.

Unit 4 Applications on Big Data Using Pig and Hive

Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere Big Insights and Streams. Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

Suggested Reading

- Chris Eaton, Dirk Deroos, Tom Deutsch et al., (2012). Understanding Big Data, McGrawHill, 2012.
- Alberto Cordoba. (2014). Understanding the Predictive Analytics Lifecycle, Wiley.
- Eric Siegel, Thomas H. Davenport. (2013). Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die. Wiley.
- James R Evans (2013). Business Analytics – Methods, Models and Decisions, Pearson.
- R. N. Prasad, Seema Acharya (2015). Fundamentals of Business Analytics, Wiley.

- S M Ross (2011). Introduction to Probability and Statistics for Engineers and Scientists, Academic Foundation.

Practical

(Total Hours 60)

1. Data processing operators in Pig – Hive services – HiveQL
2. Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams.
3. Simple linear regression
4. Multiple linear regression-
5. Interpretation of regression coefficients.
6. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications

FS01CA -6C2 - Artificial Intelligence

(Total Hours 60)

Goal: This course will disseminate the student with the most fundamental knowledge for understanding AI and some basic search algorithms for problem solving; knowledge representation and reasoning; pattern recognition; fuzzy logic; and neural networks.

Objectives By the end of this course, a student will

- Explain different types of AI Agents.
- Define various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
- Examine the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.

Unit 1 Introduction

Introduction to AI, history of AI, course logistics; Intelligent agents, uninformed search; Heuristic search, Stochastic search methods; A* algorithm; Adversarial search, games- minimax, alpha-beta pruning.

Unit 2 Basic Concepts

Constraint Satisfaction Problems; Machine Learning: Basic concepts, linear models, perception, K nearest neighbours; Machine Learning: advanced models, neural networks, SVMs, decision trees and unsupervised learning.

Unit 3 Decision processes

Markov decision processes and reinforcement learning; Logical Agent, propositional logic and first order logic.

Unit 4 AI Applications

AI applications (NLP); AI applications(Vision/Robotics).

Suggested Reading

- E. Rich and K. Knight, 'Artificial Intelligence', 2nd Edn., McGraw Hill, 1999.
- David W. Rolston, 'Principles of Artificial Intelligence and Expert System Development', 2nd Edn., McGraw Hill, 2003.
- D.W. Patterson, 'Introduction to AI and Expert Systems', 1st Edn., PHI, 1999.
- Nils J. Nilsson, 'Artificial Intelligence -A New Synthesis', Harcourt Asia Ltd, 2nd Edn., 2000.

FS01CA -6S1 Industry Academia Interaction

(Total Hours 30)

Goal: This course will enable the students to speak confidently with any speakers of English, including native speakers.

Objectives By the end of this course, a student will

- Speak effortlessly in different contexts – informal and formal.
- ‘Think on feet’ even in difficult circumstances.
- Hold interesting and meaningful conversations with others, including strangers.
- Listen to others with utmost attention.
- Develop Negotiating skills.

Unit 1 Personal Communication: Day-to-day conversation with family members, neighbours, relatives, friends on various topics, context specific – agreeing/disagreeing, wishing, consoling, advising, persuading, and expressing opinions, arguing.

Unit 2 Social Communication: Telephone calls (official), colleagues in the work spot, discussing issues (social, political, cultural) clubs (any social gathering), answering questions, talking about films, books, news items, T.V. programmes, sharing jokes.

Unit 3 Group/Mass Communication: Group discussion (brainstorming), debate, panel discussion, anchoring/master of ceremony, welcome address, proposing vote of thanks, introducing speakers, conducting meetings, making announcements, Just-a-minute (JAM), Block and tackle, shipwreck, spoof, conducting quiz, negotiations, oral reports.

Unit 4 Integrated Speaking & Presentation Skills: Listening to speak (any radio programme/lecture), reading to speak, writing to speak, watching to speak, (any interesting programme on TV) Reading aloud any text/speech, lecturing, PowerPoint presentation, impromptu, Interviews of different kinds (one to one, many to one, stress interview, telephonic interview).

Unit 5 Employability & Corporate Skills: Interview skills – Types of interview, preparation for interview, mock interview. Group Discussion –Communication skills in Group Discussion, Structure of GD, GD process, successful GD techniques, skills bought out in GD – leadership and co-ordination. Time management and effective planning – effective time management, time management techniques, relationship between time management and stress management. Stress management – causes and effect, coping strategies; Decision making and Negotiation skills, People skills, Team work, development of leadership qualities.

Suggested Reading

- Richard Denny, “Communication to Win”; 1st Ed, 2008, Kogan Page India Pvt. Ltd.
- Sanjay Kumar, PushpLatha, “Communication Skills”, 1st Ed, 2011, Oxford University Press
- Courtland L. Bovee, John. V. Thill, “Business Communication Today”, 2nd Ed, 2007, Pearson
- Lesikar, Marie, E, Flatley, Rentz, N Pande.”Business Communication”, 3rd Ed, 2012, Mcgraw Hill
- R.C.Sharma, Krishna Mohan,”Business Correspondence and Report Writing”, 1st Ed, 2009, Mcgraw Hill
- Shirley Taylor, V.Chandra, “Communication for Business”, 1st Ed, 2008, Pearson
- HorySankar Mukherjee, “Business Communication’, 2nd Ed, 2009, Oxford University Press

FS01CA -6D1- Internet of Things

(Total Hours 60)

Goal: The Internet of Things (IoT) is aimed at enabling the interconnection and integration of the physical world and the cyber space. It represents the trend of future networking, and leads the third wave of the IT industry revolution.

OBJECTIVES:

1. To introduce the concept of “Internet of Things” to the students.
2. To understand the basic ecosystems and landscape in IoT.
3. To understand the real time use cases in IoT
4. To know the different domains, where IoT plays a crucial role.

Unit 1

Introduction to IoT: What is IoT, IoT architecture, Characteristics of IOT systems, Prevalent IoT architectures, IoT applications, Overview of different technologies involved for IoT realization.

Unit 2

History of IoT: The transition from mainframes and personal computing, Planet lab and origins of distributed computing; Robotics, AI and Cyber Computing Infrastructure; M2M communications; P2P networks; Universal identification and RFID; Autonomic computing, Pervasive computing, Ubiquitous computing; Wireless Sensor Networks; The emergence of IoT.

Unit 3

IOT state of the art: The IoT ecosystem and landscape; IOT business models and its usage in various domains; Technology Enablers for IOT – Mobility, Analytics, Cloud and social media; IOT platforms; Security; Test methodologies; Regulations and Risks.

Unit 4

IoT Characteristics and use cases: Consumer and enterprise use cases

Unit 5

IoT DOMAINS: Smart Home, Smart Buildings, smart cities, IoT in telecommunications, smart manufacturing, IoT in environment monitoring, smart vehicles, IoT in healthcare, smart farming, IoT in enterprises, smart transportation, smart energy, smart retail and logistics

Suggested Reading:

1. Vijay Madiseti, Arshdeep Bahga “Internet of things, A hands-on-approach” 2014
2. Jean-Philippe Vasseur & Adam Dunkels “Interconnecting smart objects with IP”, Morgan Kaufmann Publishers, 2010
3. Cuno Pfister, “Getting Started with the Internet of Things” , Maker Media Inc, 2011
4. Adrian McEwen and Hakim, “Designing the Internet of Things”, Wiley publication, 2013

FS01CA -6D2 – PROJECT

(Total Hours 90)

Goal: Using a project-learning approach can invigorate the learning environment, empowering and engaging students as they explore authentic, real-world challenges.

Project based learning is an instructional approach that lends itself easily to the creation of projects. A project is an open-ended assignment that uses technology to create a unique product that is student-driven with the goal of achieving specific learning Goal from multiple subject areas. Throughout the learning process, technology is used to acquire, organize, demonstrate, and communicate information. The seamless integration of technology into each stage of the project creates a meaningful learning experience.

Project Based Learning is personally meaningful to students because although everyone in the class may be learning the same technology skill, each student can pursue their own interests within the framework of the technology project.

Objective of the project is to provide

- A professional portfolio of projects and real experience with data analysis that will give you the necessary confidence to be successful as a Data Analyst.
- Interdisciplinary activities target learning Goal from multiple subject areas
- Simulates real problems to have students actively devise solutions
- Creates learning opportunities based upon student interest and strengths
- Engages learners by offering a meaningful learning activity
- Offers multiple ways for students to participate and demonstrate their knowledge
- Accommodates different learning styles
- Encourages the mastery of technological tools
- Prompts students to collaborate
- Offers a learning experience that draws on creative and critical thinking

Course Content and Process

The students with the assistance of their faculty–in-charge or course coordinator will do the project (which may also be a continuation of their mini project or an altogether new project) individually in collaboration with an industry which would be assessed.

Total credits would be 6 (90).

The students have to submit a project report and also have to attend a viva after their project presentation.

Marks would be out of 100.

You will be working in a team, as is usually the case in the world of work. You will be supervised by a tutor, who is always available to answer any questions or clear up any doubts, and who will assess your performance and advice on the project "deliverables". The project work is an educational pedagogy that enables a student in learning-by-doing approach in all its complexity and scope.

At the start of the course, you are assigned a tutor who is a professional expert. The tutor will foster teamwork and promote discussion of issues, helping you find Syllabus: Data Analytics & Big Data solutions and resolve the difficulties of the project by drawing on your own resources. They will

give you feedback on the “deliverables” for each project at every stage, so that you can continually refine them, learning from your mistakes and achieving the mastery needed for each task.

Some topics:

Modern scientific instruments and Internet-scale applications generate voluminous data pertaining to vital signs, weather phenomena, social networks that connect millions of users, the origins of distant planets. Data produced in these settings hold the promise to significantly advanced knowledge.

Fundamental issues in Big Data-

Issues related to data organization, storage, retrieval, analysis and knowledge discover at scale. This will include topics such as large-scale data analysis, data storage systems, self-descriptive data representations, semi-structured data models.

Will involve hands-on programming assignments and term project using real-world datasets.

Suggested Reading

- Rajaraman, Fundamentals of computers 4th Edition, Prentice Hall of India.
- Peter Norton, Introduction to computer 4th Edition, Tata McGraw Hill
- J. Shelly & Roger Hunt, Computer studies, Wheeler’s Publication.142
- C.S. French, Computer Studies, Arnold Publishers.
- Thomas C. Bartee, Digital Computer Fundamentals, McGraw Hill International.