



**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)**

**(CYBER FORENSIC, DATA ANALYTICS AND CYBER SECURITY)**

**(CURRICULUM - EFFECTIVE FROM 2020-21)**

**ATTESTED**

**Dr. Gangadhara Somayaji K.S.**  
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**NOTIFICATION-39-ACM/04/2020 dtd. 09.09.2020**

Sub: Starting of new programmes of BCA and B.Sc.

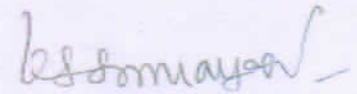
Ref: Resolution of the Academic Council at its 39<sup>th</sup> meeting held on 27.08.2020  
vide agenda-14

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The Academic Council at its 39<sup>th</sup> meeting held on 27.08.2020 and subsequently the Board of Management at its 50<sup>th</sup> meeting held on 28.08.2020 have resolved to approve the proposal for starting of the following 3 years BCA and B.Sc. programmes (Choice Based Credit System) under the Faculty of Science along with other running courses of B.Sc. and BCA.

1. BCA (Cyber Forensics, Data Analytics and Cyber Security) with an annual intake of 210
2. BCA (Robotics, Machine Learning and Artificial Intelligence) with an annual intake of 140
3. B.Sc. (Forensic Science, Data Analytics and Cyber Security) with an annual intake of 140

This notification issued for implementation with effect from the academic year 2020-21



**REGISTRAR**

Copy to:

1. The Principal, YIASC&M
2. Faculty of Science
3. Controller of Examinations
4. File copy

# **BCA (Cyber Forensics, Data Analytics and Cyber Security)**

This is a full time three-year degree course, on the new area of technology - Cyber Forensic. In order to control the criminal activities in the money transactions, e-commerce, website management, social networking etc., every public/private sector organization require the service of a cyber-security expert. Cyber/Computer Forensics or Digital Forensics is the process of extracting information and data from computers while investigating a cybercrime. Experts in Forensic analyse the digital media with the aim of identifying, preserving, recovering and presenting facts and findings. There is a high demand of forensic experts in the police and vigilance departments, investigating agencies, detective agencies. An opportunity as teachers where criminology is taught is another bright option. The curriculum of the course includes, Programming practices in C++, Java, Internet Technology & Cyber Laws, Hands on sessions in Internet Programming & Computer Security, Biometric security, Preserving and Recovering Digital Evidence, Ethical Hacking & Digital Forensic Mobile & Wireless Security, Security Threats and vulnerabilities etc. Students will be exposed to real-world problems, open-end problems and simulated real-life scenarios with active guidance from domain experts in this field.

The rise in the widespread use of technology paves a way to rise in cybercrime. For hackers, the possibilities increased exponentially, along with the potential rewards like ransomware. Hence being cautious about the situation, the internet experts paying attention by investing a lot of time and money in predicting cyber security trends. This programme aims to provide a foundational platform for Cyber Security aspirants by providing Cyber Security Awareness and Training that heighten the chances of catching a scam or attack before it is fully enacted, minimizing damage to the resources and ensuring the protection of information technology assets. The programme focuses to cover all cyber security landscapes theoretically and practically. This course provides a range of career opportunities in Cyber Security Sectors as Network/Application Security Analyst, Cyber Security Analyst, Cyber Security Analyst (Soc) Security Automation, Cyber Security Practitioner, Cyber Defense Analyst, Penetration Tester, Information Security Engineer in leading IT Industries and to act as Cyber Security Experts in inGovernmental Organizations.

## **Programme Outcomes**

Yenepoya University proposes to conduct BCA (Cyber Forensics, Data Analytics and Cyber Security); The programme will help the students to:

- Comprehend the various security threats and vulnerabilities of the cyber world keeping in line with industrial trends.
- Scale up to the demand from multiple industrial sectors on the cyber world to promote effective methods, practices and tools to counter the cybercrimes.
- To be able to architect, design and implement fool-proof product line in the field of cyber security.
- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
- Practice with an expertise in academics to design and implement securitysolutions.
- Understand key terms and concepts in Cryptography, Governance and Compliance.
- Develop cyber security strategies and policies.

- Understand principles of web security and to guarantee a secure network by monitoring and analysing the nature of attacks through cyber/computer forensics software/tools.

### **Programme Specific Outcomes**

Upon successful completion of the programme, candidates will be familiar with cyber security landscapes and able to:

1. Analyze and evaluate the cyber security needs of an organization.
2. Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
3. Measure the performance and troubleshoot cyber security systems
4. Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
5. Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators
6. Design and develop security architecture for an organization.
7. Design operational and strategic cyber security strategies and policies.

### **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 (any stream) of 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](http://www.yenepoya.edu.in)) and the college office for the applicants. A merit list will be prepared of selected candidates based on the 12<sup>th</sup> class marks /PUC marks. Reservation of seats will be followed as per the university Bye Laws.

**4. Total Intake of Students:** 210 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
<b>Total</b>	<b>100</b>

### 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	Objective Questions	25 questions x 1 mark each	25 Marks
Section B	Short Answers or case	5 Questions x 5 marks each	25 Marks
<b>Total</b>			<b>50 Marks</b>

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

Section A	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
<b>Total</b>			<b>75 Marks</b>

**B) Examination Scheme for**

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

**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.
- 33.



### **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 reevaluation 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:

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

**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.

$SGPA = \frac{\sum \text{Credits} \times \text{Grade Points}}{\text{Total Credits}}$

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.

$CGPA = \frac{\sum \text{Total credits in the semester} \times SGPA}{\text{Total credits of the course}}$  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:

<b>Letter Grade</b>	<b>Grade Point</b>	<b>Range of mark</b>
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 (Cyber Forensics, Data Analytics and Cyber Security)

Semester – I								
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
DC01CF-1C1	Fundamentals of Information Technology -Theory	4	-	-	25	75	100	4
DC01CF-1P1	Fundamentals of Information Technology - Practical	-	-	4	CIA		100*	2
DC01CF-1C2	Computer System Architecture - Theory	4	-	-	25	75	100	4
DC01CF-1P2	Computer System Architecture-Practical	-	-	4	CIA		100*	2
DC01CF-1C3	Soft Skills & Business Communication	4	-	-	25	75	100	4
DC01CF-1C4	Basic Mathematics & Statistics	4	-	-	25	75	100	4
DC01CF-1C5	Social Responsibility and Community Engagement	2	-	-	CIA		100*	2
	<b>Total</b>	<b>18</b>	<b>-</b>	<b>8</b>			<b>700</b>	<b>22</b>
Semester – II								
DC01CF-2C1	Programming Fundamentals using C++ -Theory	4	-	-	25	75	100	4
DC01CF-2P1	Programming Fundamentals using C++ - Practical	-	-	4	CIA		100*	2
DC01CF-2C2	Database Management System -Theory	4	-	-	25	75	100	4
DC01CF-2P2	Database Management System - Practical	-	-	4	CIA		100*	2
DC01CF-2C3	Environmental Studies	2	-	-	25	75	100	2
DC01CF-2C4	Statistical Techniques with R	4	-	-	25	75	100	4
	<b>Open Elective I</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>CIA</b>		<b>100*</b>	<b>2</b>
	<b>Total</b>	<b>14</b>	<b>2</b>	<b>8</b>			<b>700</b>	<b>20</b>
Semester – III								
DC01CF-3C1	Introduction to Cyber Forensics & Cyber Laws	4	-	-	25	75	100	4
DC01CF-3C2	Data Structures	4	-	-	25	75	100	4
DC01CF-3C3	Operating Systems -Theory	4	-	-	25	75	100	4
DC01CF-3P1	Operating Systems - Practical		-	4	CIA		100*	2

DC01CF-3C4	Research Methodology	2	-	-	25	75	100	2
DC01CF-3C5	Web Application and Development -Theory	4	-	-	25	75	100	4
DC01CF-3P2	Web Application and Development - Practical	-	-	4	CIA		100*	2
	<b>Total</b>	<b>18</b>	<b>-</b>	<b>8</b>			<b>700</b>	<b>22</b>
<b>Semester – IV</b>								
DC01CF-4C1	Software Engineering	4	-	-	25	75	100	4
DC01CF-4C2	Biometric Security -Theory	4	-	-	25	75	100	4
DC01CF-4P1	Biometric Security	-	-	4	CIA		100*	2
DC01CF-4C3	Programming in Java -Theory	4	-	-	25	75	100	4
DC01CF-4P2	Programming in Java - Practical	-	-	4	CIA		100*	2
DC01CF-4C4	Computer Networks	2	-	-	25	75	100	2
DC01CF-4C5	Entrepreneurship	2	-	-	25	75	100	2
	<b>Open Elective II</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>CIA</b>		<b>100*</b>	<b>2</b>
	<b>Total</b>	<b>16</b>	<b>2</b>	<b>8</b>			<b>800</b>	<b>22</b>
<b>Semester - V</b>								
DC01CF-5C1	Preserving and Recovering Digital Evidences	4	-	-	25	75	100	4
DC01CF-5C2	Mobile & Wireless Security	4	-	-	25	75	100	4
DC01CF-5C3	Computer Security	4	-	-	25	75	100	4
DC01CF-5C4	Cryptography and Cyber Security	4	-	-	25	75	100	4
DC01CF-5C5	Data Analytics -Theory	4	-	-	25	75	100	4
DC01CF-5P1	Data Analytics - Practical	-	-	4	CIA		100*	2
	<b>Total</b>	<b>20</b>	<b>-</b>	<b>4</b>			<b>600</b>	<b>22</b>
<b>Semester – VI</b>								
DC01CF-6C1	Security Threats & Vulnerabilities	4	-	-	25	75	100	4
DC01CF-6C2	Ethical Hacking and Digital Forensics -Theory	4	-	-	25	75	100	6
DC01CF-6P1	Ethical Hacking and Digital Forensics - Practical	-	-	4	CIA		100*	
DC01CF-6C3	Computer Forensics	4	-	-	25	75	100	4
DC01CF-6C4	Project	2	2	4	CIA		100*	6

DC01CF-6C5	Ethics in Information Technology and Computer Communication	2	-	-	25	75	100	2
	<b>Total</b>	<b>16</b>	<b>2</b>	<b>8</b>			<b>600</b>	<b>22</b>
<b>Grand total credits of (I,II,III,IV,V and VI Semester )</b>							<b>4100</b>	<b>130</b>

\*Continuous Internal Assessment (CIA).

**Open Elective I:** (DC01CF-2OE1, DC01CF-2OE2, DC01CF-2OE3) Or DC01CF-2OE4

DC01CF-2OE1 Trace evidences in crime scene

investigation

DC01CF-2OE2 Questioned Document Analysis

DC01CF-2OE3 Police Administration and Crime Investigative Agencies

DC01CF-2OE4 Swayam Course (SWAYAM course related to the above mentioned electives)

**Open Elective II:** (DC01CF-4OE1, DC01CF-4OE2, DC01CF-4OE3) Or DC01CF-4OE4

DC01CF-4OE1 Forensic Photography and Voice

Analysis

DC01CF-4OE2 Criminal Laws

DC01CF-4OE3 Security and Vigilance in Justice System

DC01CF-4OE4 Swayam Courses (SWAYAM course related to the above mentioned electives)

**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.

<b>End Semester Exam (ESE) 50 Marks</b>	<b>Continuous Assessment (CA) 50 Marks</b>			
	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	

## DC01CF-1C1- Fundamentals of Information Technology

(Total Hours 60)

**Goal:** To impart the knowledge about the evolution of computers, classification, various peripherals of computers, types of software's 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.

### **Teaching Learning Methodology:**

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, 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, Quiz, Jigsaw and crosswords.

### **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, webcam, flatbed 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:**

- Sharma, A. K. (2018). Computer fundamentals and programming in C.
- Norton, P. (2005). Peter Norton's Introduction to Computers. McGraw-Hill Education.
- Goel, A., & Mittal, A. (2015). "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
- ESL, I. (2012). Introduction to Information Technology. Pearson Education India.

#### **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
  - a. D.A = 10% of basic pay
  - b. H.R.A – if basic pay is less than 25,000 H.R.A 10% of basic else H.R.A 25% of basic.
  - c. Gross= D.A+H.R.A+Basic Pay
  - d. Provident fund = 12% of basic pay.

## DC01CF-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.

### **Teaching Learning Methodology:**

Lectures, Demonstration using IC trainer kits, Class discussions, assignments, Discussion groups, Student Presentation, Textbook assignment, 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.

### **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

- Mano, M. M. (2003). Computer system architecture. Prentice-Hall of India.
- Mano, M. M., & Ciletti, M. D. (2007). Digital design. Upper Saddle River, NJ: Pearson Prentice Hall.
- Hamacher, V. C., Vranesic, Z. G., Zaky, S. G., Vransic, Z., & Zakay, S. (1984). Computer organization. New York: McGraw-Hill.
- Dos, A. J. (2004). Assembly language and computer architecture using C++ and Java. Brooks/Cole.
- Stallings, W. (2019). Computer organization and architecture: designing for performance. Pearson.

### 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
  - AND
  - OR
  - NOT
  - NOR
  - NAND
  - XOR
  - XNOR
2. Simple Boolean Expression using Basic gates and Universal gates:  $A.(B+A) + B.A$
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

## DC01CF-1C3 – Soft Skills & Business Communication

(Total Hours 60)

**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

### **Teaching Learning Methodology:**

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Use of flip chart board by instructor as aid in teaching, Use of slides, Quiz, Jigsaw and crosswords.

### **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 W's 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:**

##### **Prose:**

A Snake in the Grass

R K Narayan

##### **Poetry:**

On his Blindness

John Milton

##### **Suggested Reading:**

1. Monippally, M. M. (2001). Business communication strategies. Tata McGraw-HillPub. New Delhi.
2. Bovée, C. L., Thill, J. V., & Raina, R.L. (2016). Business communication today. Pearson India Education Services Pvt. Ltd.
3. Ober, S. (2009). Contemporary business communication. Houghton Mifflin.
4. Thill, J. V., & Bovee, C. L. (2019). Excellence in business communication. Pearson.
5. Lesikar, R. V., & Flatley, M. E. (2005). Basic business communication: skills for empowering the internet generation. Boston, Mass. McGraw-Hill/Irwin C.
6. Ludlow, R., & Fergus Panton. (1995). The essence of effective communication. Prentice-Hall of India.
7. Chaturvedi, P. D. (2013). Business Communication: concepts, skills, cases and applications.
8. Murphy, H. A., Hildebrandt, H. W., & Thomas, J. P. (1997). Effective business communications. New York: McGraw-Hill.

## DC01CF-1C4 -Basic Mathematics & Statistics

(Total Hours 60)

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

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

- 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

### **Teaching Learning Methodology:**

Lectures, Discussion groups, Student Presentation, Textbook assignment, 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.

### **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  $\theta$  when  $\theta$  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:**

- Narayan, S., & Mittal, P. K. (2005). Integral calculus. Chand.
- George, F. (1960). Higher mathematics for students of engineering and science. Macmillan; New York.
- Kandasami. (2012). Allied mathematics. S Chand & Co Ltd.
- Cochran, W. L. (2018). Single Variable Calculus.
- Tom Mike Apostol. (2003). Calculus. John Wiley & Sons.
- William Snow Burnside. (1960). The Theory of equations / 2. Dover.
- Snow, W., & Arthur William Panton. (2005). The theory of equations: with an introduction to the theory of binary algebraic forms. Dover Publications.
- Beecher, J. A., Penna, J. A., & Bittinger, M. L. (2016). Algebra and trigonometry. Pearson.

## DC01CF-1C5-Social Responsibility and Community Engagement

(Total Hours:30)

### Goal:

This paper will help the students

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

### Learning Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic Improvements

### Course Content:

#### Unit 1: Appreciation of Rural Society (08 hours)

Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

**Assignment:** Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.

#### Teaching/ Learning Methodology

1. Interactive Lectures (03 hours)
2. Self directed learning (03 hours)
3. Field activities (02 hours)

#### Unit 2: Understanding rural economy & livelihood (08 hours)

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.

**Assignment:** Describe your analysis of rural household economy, its challenges and possible pathways to address them.

#### Teaching/ Learning Methodology

1. Interactive Lectures (02 hours)
2. Self-directed learning (02 hours)
3. Field activities (04 hours)



**Unit 3: Rural Institutions (07 hours)**

Traditional rural organizations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

**Assignment:** How effectively are Panchayat raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)

**Teaching/ Learning Methodology**

1. Interactive Lectures (02 hours)
2. Field activities (05 hours)

**Unit4: Rural Development Programmes (07 hours)**

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralized Planning, NRLM, MNREGA, etc.

**Assignment:** Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.

**Teaching/ Learning Methodology**

1. Interactive Lectures (01 hour)
2. Field activities (04 hours)
3. Assignment (02 hours)

**Assessment:** - Feedback, MCQs, Submission & presentation of project work/Survey findings

**Continuous Internal Assessment (CIA)**

Internal Assessment is continuous and details are notified well in advance. CIA consists of the following

SN	Assessment for 100 marks	Marks
1	Objective type questions	20
2	Presentation / Survey Findings	50
3	Assignment/Seminars/Viva-voce/ Class Interaction/Attitude	20
4	Log Book	10

**Recommended field-based practical activities:**

- Interaction with SHG women members and study of their functions and challenges; planning for their skill building and livelihood activities
- Visit MGNREGS project sites interact with beneficiaries and interview functionaries at the work site
- Field visit to Swachh Bharat project sites conduct analysis and initiate problem solving measures
- Conduct Mission Antyodaya surveys to support under Gram Panchayat Development Plan (GPDP)
- Interactive community exercise with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization
- Visit Rural Schools/mid-day meal centres study Academic and infrastructural

resources and gaps

- Participation Gram Sabha meetings and study community participation
- Associate with Social audit exercise at the Gram Panchayat level, and interact with programme beneficiaries
- Attend Parent Teacher Association meetings and interview school drop outs
- Visit local Anganwadi Centre and observe the services being provided
- Visit local NGOs civil society organizations and interact with their staff and beneficiaries,
- Organize awareness programmes health camps Disability camps and cleanliness camps
- Conducts oil health test drinking water analysis energy use and fuel efficiency surveys
- Raise understanding of people's impacts of climate change building up community's Disaster preparedness
- Organize orientation programmes for farmers regarding organic cultivation rational use of irrigation and fertilizers and promotion of traditional species of crops and plants
- Formation of committees for common property resource management village pond Maintenance and fishing

**Credit:** 2 credit, 30 hours, at least 50% in field, compulsory for all students

**Contents:** Divided into four Modules, field immersion is part of each Unit

**Course Structure:** 2Credits Course (1Credit for Class room and Tutorials and 1Credit for Field Engagement)

### **Suggested Readings**

#### **Books:**

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration Rajiv Gandhi Chair for Panchayat Raj Studies,2002.
3. United Nations, Sustainable Development Goals, 2015un.org/sdgs/
4. M.P. Boraian, Best Practices in Rural Development, Shanlax Publishers, 2016.

#### **Journals:**

1. Journals of Rural development, (published by NIRD & PR Hyderabad)
2. Indian Journal of Social Work, (by TISS, Bombay)
3. Indian Journal of Extension Education (by Indian Society of Extension Education)
4. Journal of Extension Education (by Extension Education Society)
5. Kurukshetra (Ministry of Rural Development, GoI)
6. Yojana (Ministry of Information and Broadcasting, GoI)

## DC01CF-2C1 - Programming Fundamentals using C++

(Total Hours 60)

**Goals:** 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.

**Objectives:** 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

### **Teaching Learning Methodology:**

Lectures, Demonstration by program execution using various software tools, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies by programming assignments. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching.

### **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**

- Sourav Sahay. (2012). Object oriented programming with C++. Oxford University Press, Oup India; New Delhi.
- Schildt, H. (2002). The complete Suggested Reading C++. Tata MsGraw Hill.
- Schildt, Herb. (2002). The Complete Suggested Reading C++. Tata McGraw-Hill, Fourth Edition.
- Lafore, R. (2002). Object-oriented programming in C. Indianapolis, IN: Sams. Ashok N Kamathane. (2003). Object Oriented Programming with ANSI & Turbo C++, Pearson.
- Bjarne Stroustrup, & Addison-Wesley (1942-1999). (2018). The C++ programming language. Addison-Wesley, Cop.
- Venugopal, K.R., & Rajkumar Buyya. (2013). Mastering C++. Mcgraw-Hill Education (India).
- Venugopal K R, RajkumarBuyya and Ravishankar T. (2006). Mastering C++, TMH.
- Balagurusamy. E., (2013). Object oriented programming with C++. Tata Mcgraw-Hill.
- Dewhurst, S. C. (2009). C++ common knowledge: essential intermediate programming. Addison-Wesley.
- Malik, D. S. (2018). C++ programming: from problem analysis to program design. Cengage Learning.
- Schildt, H., & Eloy Pineda Rojas. (2009). C++ Programming, Mcgraw-Hill.
- Savitch, W. (2018). Problem solving with C++. New York, Pearson.
- Savitch, W. J. (2003). Visual C++ 6.0: companion to Problem solving with C++: the object of programming. Addison-Wesley.

### **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

## DC01CF-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.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Demonstration using program execution, Discussion groups, Student Presentation, Textbook assignment, 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.

### **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

- Rob, P., & Coronel, C. (2003). Database systems: design, implementation, and management. Course Technology.
- Ramez Elmasri, & Sham Navathe. (1272). Fundamentals of database systems. Seiten Verlag Nicht Ermittlbar.
- Elimasri / Navathe. (2007). Fundamentals of Database Systems, 5th Ed., Pearson Addison Wesley
- Raman A Mata – Toledo/Panline K Cushman. (2007). Database Management Systems, Schaum'sOutlibe Series, Tata McGraw Hill.
- Date, C. J. (2004). An introduction to database systems. Pearson Education India.
- Kahate, A. (2004). Introduction to database management systems. Pearson Education India.

### 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 Reading key: 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 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 hisemployees.
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

- Write a pl/sql program to check the given number is strong or not.
- Write a pl/sql program to check the given string is palindrome or not.
- Write a pl/sql program to swap two numbers without using third variable.
- Write a pl/sql program to generate multiplication tables for 2,4,6
- Write a pl/sql program to display sum of even numbers and sum of odd numbers in the given range.
- Write a pl/sql program to check the given number is polindrome or not.
- 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)
- Write a procedure to update the salary of employee, who belongs to certain department with a certain percentage of raise.

## DC01CF-2C3- 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.

### **Teaching Learning Methodology:**

Lectures, Class discussions, field visits, Discussion groups, Student Presentation, Textbook assignment, 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.

### **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: Forest ecosystem, Grassland ecosystem, Desert ecosystem, 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 & 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

- Gleick, P. H. (1993). *Water in crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p, 9.
- Odum, E. P., & Barrett, G. W. (1971). *Fundamentals of ecology* (Vol. 3, p. 5). Philadelphia: Saunders.
- *Environmental and Pollution Science (Third Edition)*. (2020). Academic Press.
- Gupta, S. R. (2014). *Ecology environmental science and conservation*. S Chand.
- Sodhi, N. S. (2013). *Conservation biology: voices from the tropics*. Wiley Blackwell.
- Ronald Ernest Bartlett. (1971). *Waste water treatment*. Applied Science Publishers.
- Raven, P. H., & Berg, L. R. (2003). *Environment. Study guide*. Wiley.
- Shyam Divan, & Armin Rosencranz. (2002). *Environmental law and policy in India*. Oxford University Press.
- Ramprasad Sengupta. (2004). *Ecology and economics: an approach to sustainable development*. Oxford University Press.
- Rosencranz, A., Divan, S., & Noble, M. L. (2001). *Environmental law and policy in India*. Tripathi.
- 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. (2013). *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.

## DC01CF-2C4- 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.

### **Teaching Learning Methodology:**

Lectures, Demonstrations using softwares, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies by coding. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching.

### **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**

- Ross, S. M. (2020). Introduction to probability and statistics for engineers and scientists.
- Montgomery, D. C. (2019). Applied statistics and probability for engineers. Wiley.
- Christian Albright, Winston, W. L., & Zappe, C. J. (2010). Data analysis and decision making with Microsoft Excel. South-Western; Andover.
- Black, K. (2013). Applied business statistics: making better business decisions. Wiley; Chichester.
- Boslaugh, S. (2013). Statistics in a nutshell. O'reilly.
- Gupta, S. C., & Kapoor, V. K. (2018). Fundamentals of mathematical statistics. Sultan Chand & Sons.
- Kurtz, T. E. (1963). Basic statistics. Prentice-Hall.
- Rice, J. A. (2007). Mathematical statistics and data analysis. Cengage Learning/Brooks/Cole, Reimp.

## **Open Elective 1**

### **DC01CF-2OE1-Trace evidences in crime scene investigation**

(Total hours-30)

**Goals:** Students will learn about the traces of evidence in the crime scene investigation.

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

- To know about different laboratories
- The fundamental principles on which the science of fingerprinting is based.
- Fingerprints are the most infallible means of identification.
- The physical and chemical techniques of developing fingerprints on crime scene evidence.
- The significance of foot prints, Ballistics,

#### **Teaching Learning methods**

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies. Use of displays by instructor, Use of slides, Quiz, Jigsaw and crosswords.

#### **Unit 1**

Introduction to Forensic Science:

- a) Meaning, definition and principles
- b) Role of forensic science in crime detection
- c) Forensic Science Lab., different branches & their functions

#### **Unit 2**

Finger Print: Meaning, Importance and History, Patterns and Classification of Finger Prints, Development of fingerprints, Analysis of fingerprints, Sequential Treatment and Enhancement., Photographic of fingerprints, Digital Transmission

#### **Unit 3**

Forensic Ballistics: Classification of Fire-Arms. Ammunition- Cartridge and their Components Identification, Collection and Preservation of Ballistic Evidences found in a Crime Scene Analysis of Suicidal, Homicidal and Accidental Shoot out cases

#### **Unit-4**

Foot Print/Shoe Print in crime detection., Types of Foot Print, Preservation, Recording and Evidentiary Value of Foot Print, Walking Picture/Gait Pattern

#### **Suggested Readings**

- Nabar B.S.– 2005 (3rd Ed.) Forensic Science in Crime Investigation, Asia Law House, Hyderabad.
- Ratan Deepak & Zaidi Mohd. Hasan (2008) – Forensic Science in India and the World, Alia Law Agency, Allahabad-001.
- Saferstein Richard–(1978) Criminalistics: Introduction to Forensic Science, Prentice Hall of India Private Ltd., New Delhi
- Sharma B.R. - Forensic Science in Criminal Investigation, Central Law Agency, Allahabad-2
- Fisher A.J. Barry - Techniques of Crime Scene Investigation, IV Ed. Elsevier Science Publication Co., Inc 655 Avenue of the American
- Walls H. J.(2nd Ed. 2008)–Forensic Science: An Introduction to Scientific Crime Detection, Universal Law Publishing Co. Pvt. Ltd. New Delhi-33.

## DC01CF-2OE2-Questioned Document Analysis

(Total hours-30)

**Goals:** The examination's primary purpose is to provide evidence about suspicious or questioned documents using a variety of scientific principles and methods.

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

- Analysis of documents and handwriting
- Identifications of forgeries
- Analysis of computer prints

### Teaching Learning methods

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies. Use of displays by instructor, Use of slides, Quiz, Jigsaw and crosswords.

### Unit I

Questioned Document: Nature, Development and Importance. Classification of Questioned documents, Photography of Handwriting and signatures for forensic analysis. Forgery- and its types.

### Unit 2

Handwriting and Signature: Characteristics, Basis of Identification, Variations and Factors affecting Writing, Comparison of Handwriting/ Signature, Disguise Writing: Meaning, Characteristics and Recognition

### Unit 3

Type Written/ Computer Print Identification, Stylothesis and Anonymous writing, Difference between Graphologists and a Questioned Document expert. Examination and analysis of questioned documents, Currency Note examination: Identifying features of fake and genuine Indian currency notes.

### Suggestive reading

- Mathiharan K. & Patnaik K. Amrit (Ed. 2008) - Modi's Medical Jurisprudence and Toxicology (23rd edition), Butterworths Wadhwa, Nagpur.
- Ratan Deepak & Zaidi Mohd. Hasan (2008) – Forensic Science in India and the World, Alia Law Agency, Alahabad-211 001.
- Sharma B. R. (4th Ed. 2008)- Forensic Science in Criminal Investigation and Trial, Universal Publishers
- Walls H. J. (2nd Ed. 2008), – Forensic Science: An Introduction to Scientific Crime Detection, Universal Law Publishing Co. Pvt. Ltd. New Delhi-33.
- Kelly, Jan Seaman & Lindblom, Brian S (2nd Edition) (2006) – Scientific Examination of Questioned Documents - CRC Press, Taylor & Francis, London.
- Sharma B. R (2008) - Bank Frauds; Prevention & Detection (3rd edition), Universal Law Publishing Co., New Delhi



## **DC01CF-2OE3 Police Administration and Crime Investigative Agencies**

(Total hours-30)

**Goal:** The purpose of this course is to study various problems of Police Administration.

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

- Functions of police organizations
- Functions of Different agencies
- Organizations of State and Indian police

### **Teaching Learning methods**

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies.

### **UNIT-1**

History Police Administration, Indian Police Service, Rank of Police, Officers–Badges, Role & Functions of Police, Institute of forensic Science (NICFS), Sardar Vallabhbai Patel National Police Academy (NPA).

### **UNIT - 2**

Bureau of Police Research and Development (BPR&D), Central Bureau of Investigation (CBI), National Crime Records Bureau (NCRB), Police training centers and functions

### **UNIT - 3**

State Level Police Organization: Criminal Investigation Department (CID), Modus Operandi Bureau (MOB), District level police, Structure of an Indian Police Station.

### **UNIT - 4**

International Investigative Agencies: Federal Bureau of Investigation (FBI), Central Investigation Agency (CIA), Enforcement Directorate(ED), Directorate General for External Security (DGSE),

### **Suggestive reading**

- Bailey B. David – Police and Political Development in India, Printed on University Press, New Jersey.
- Bharadwaj R. K. (1978) - Indian Police Administration, National Publishing House, New Delhi-02
- J.C. Chaturvedi (Editor 2006) – Police Administration & Investigation of Crime, Isha Books, New Delhi – 33.
- Ratan Deepak & Zaidi Mohd. Hasan (2008) – Forensic Science in India and the World, Alia Law Agency, Alahabad-211 001.
- Roy Sinha S. K. (3rd Ed. 2008) - Police Diaries, Premier Publishing Co., Allahabad.
- Shenoy S. Shenoy (2006) - Law Relating to Police and Prisons in Karnataka, Lawyers Law Book, Bangalore.
- Weston B. Paul & Wells M. Kenneth. - Criminal Investigation: Basic Perspectives, Prentice-Halls, Inc., London

## **DC01CF-3C1- Introduction to Cyber Forensics & Cyber Laws**

**(Total Hours 60)**

**Goal:** This course will enable the students to gain in-depth knowledge in the field of Computer forensics & Cyber Crime. The students will be able to learn investigation tools and techniques, analysis of data to identify evidence, Technical Aspects & Legal Aspects related to cybercrime.

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

- The student will be able to demonstrate foundational knowledge and skills in forensics
- Describe the origin of computer forensics and the relationship between law enforcement and industry.
- Describe electronic evidence and the computing investigation process.
- To recognize the developing trends in Cyber law and the legislation impacting cyberspace in the current situation.
- To generate better awareness to battle the latest kinds of cybercrimes impacting all investors in the digital and mobile network.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Student Presentation, Textbook assignment, 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.

### **Unit 1**

Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing malicious software. Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems

### **Unit 2**

Types of Computer Forensics Systems: Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems, Router Forensics. Cyber forensics tools and case studies. Ethical Hacking: Essential Terminology, Windows Hacking, Malware, Scanning, Cracking.

### **Unit 3**

Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection

and Archiving, Methods of Collection, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Investigating Web attacks, Investigating network Traffic ,Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events.

#### **Unit 4**

Basic of law, understanding cyber space, Defining cyber law, Scope and jurisprudence, Concept of jurisprudence, Overview of Indian legal system, Introduction to IT Act 2000, Amendment in IT Act.

#### **Unit 5**

Cyber Crimes – Types of cyber-crimes –against individual’s institution, and states-various offenses and punishments, digital signature-concepts of public key and private key, certification authorities and their role, creation and authentication of digital signature. E-contracting –salient features of E-contracts, formation of E-contracts and types, E-governance, E-governance models, E-commerce- salient features and advantages.

#### **Suggested Reading**

- Vacca, J. R. (2010). Computer forensics: computer crime scene investigation. Jonesand Bartlett Publishers.
- Ravi Kumar Jain Bandamutha. (2006). Cyber forensics: concepts and approaches. Hyderabad Icfai Univ. Press.
- Christof Paar, & Pelzl, J. (2010). Understanding cryptography: a textbook for students and practitioners. Springer.
- Jahangiri, A. (2009). Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts. Dr. Ali Jahangiri.
- EC-Council. (2009). Computer Forensics: Investigating Network Intrusions and Cyber Crime. Nelson Education.
- Hahn, H., & Stout, R. (1994). Internet complete reference. Osborne McGraw-Hill.
- Bangia, R. (2006). Internet & Web Design. Firewall Media.
- Vivek Sood. (2001). Cyber law simplified. Tata Mcgraw-Hill.

## DC01CF-3C2 -Data Structure

(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.

### **Teaching Learning Methodology:**

Lectures, Demonstrations using software's, Discussion groups, Student Presentation, Textbook assignment, Problem solving or case studies or Coding assignments. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching.

### **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
- Kamthane, A. (2003). Programming and Data Structures (For Anna University). Pearson Education India.
- Lipschutz. S. (2011). Data Structures with C. Delhi: Tata McGraw hill Reddy. P. (1999). Data Structures Using C. Bangalore: Sri Nandi Publications
- Samanta, D. (2003). Classic data structures. Prentice-Hall of India.
- Mark Allen Weiss. (2005). Data structures & algorithm analysis in C++. Addison-Wesley.
- Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). Introduction to algorithms. MIT press.
- [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/>

## DC01CF-3C3- Operating System

(Total Hours 60)

**Goal:** This course will enable the students to understand how to operating systems works, including the processes, scheduling, deadlocks, memory management

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

- Understand the Basics of Computer and Operating Systems Structure
- Realize the concept of Process Management and Mutual Execution
- Understand the concepts of the Deadlock and different approaches to memory management
- Understand the issues in protection and security

### **Teaching Learning Methodology:**

Lectures, Class discussions, Coding assignments, Discussion groups, Student Presentation, Textbook assignment, 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.

## **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 3Memory Management**

Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging in Mastics and Intel 386, Virtual Memory-Demand paging and its 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

- Deitel, H. M., Deitel, P. J., & Choffnes, D. R. (2007). Operating systems. Pearson/Prentice Hall.
- Stallings, W. (2018). Operating Systems: internals and design principles. Pearson Education Limited
- Stuart, R.C. (2008). Operating systems: Principles, Design and Implementation, 1st Ed. Cengage Learning India
- Silberschatz, A., Peter Baer Galvin, & Gagne, G. (2014). Operating system concepts. Wiley.
- Comer, D. (2004). Computer networks and internets: with internet applications. Pearson Education International.
- Stallings, W. (1988). Data and computer communication. London.

### 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 executed 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 post order traversal of a binary tree.



## DC01CF-3C4- 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

### **Teaching Learning Methodology:**

Lectures, Class discussions, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### **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**

- Krishnaswami, O. R (2012). Research Methodology. Mumbai: Himalaya publishing House.
- Bhandarkar, P. L. (2010). Methodology and techniques of social research. Himalaya Publishing House.
- Kothari, R. (2004). Research methodology: methods and techniques. New Age International.
- Panneerselvam. R., (2014). Research methodology. Phi Learning.
- Trochim, M.K. (2009). Research Methods. New Delhi: Sultan Chand.

## DC01CF-3C5 - 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.

### Teaching Learning Methodology:

Lectures, Demonstration using software's, Coding assignments, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### 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; Using jQuery 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**

- Lubbers, P., Albers, B., Salim, F., & Pye, T. (2011). Pro HTML5 programming (pp.107-133). New York, NY, USA:: Apress..
- Clark, R., Studholme, O., Murphy, C., & Manian, D. (2012). Beginning HTML5 and CSS3. Apress.
- Curioso, A., Bradford, R., & Galbraith, P. (2010). Expert PHP and MySQL. John Wiley & Sons.
- Sarris, S. (2013). HTML5 unleashed. Sams Publishing..
- Sikora, P. (2016). Professional Css3. Packt Publishing Ltd.
- Sarrion, E. (2012). jQuery UI: Learn How to use Dialogs, Autocomplete, and More. O'Reilly Media, Inc.
- Murach, J., & Harris, R. (2010). Murach's PHP and MySQL. Mike Murach & Associates, Inc.
- Freeman, A. (2012). Pro jQuery. Apress.
- Prettyman, S. (2016). Learn PHP 7: Object Oriented Modular Programming using HTML5. CSS3, JavaScript, XML, JSON, and MySQL, 308.
- Porebski, B., Przystalski, K., & Nowak, L. (2011). Building PHP Applications with Symfony, CakePHP, and Zend Framework. John Wiley and Sons.
- Curioso, A., Bradford, R., & Galbraith, P. (2010). Expert PHP and MySQL. John Wiley & Sons.

## Practicals

(Total Hours 60)

### 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. <b>, <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 Frame03

### 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 alertback 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 doGet ( ) and doPost ( ) methods. (The subject teacher should provide the appropriate problem statement for this).

## DC01CF-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.

### Teaching Learning Methodology:

Lectures, Class discussions, Student Presentation, Textbook assignment, 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.

### 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.**

- Aggarwal, K. K., Singh, Y., Kaur, A. (2007). Software Engineering, New Age International
- Sommerville, I. (2011). Software engineering. Pearson.
- Thayer, R. H., & Christensen, M. J. (2005). Software engineering. Ieee Computer Society Press.
- James Peter, W Pedrycz, “Software Engineering”, 4th Edition, 2011, Wiley India
- Fairley, R. E. (1988). Software engineering concepts. Jdigiellcom Publishers and Traders.
- Schach, S. R. (2011). Object-oriented and classical software engineering. Mcgraw-Hill.
- Kurana, R. (2011). Software Engineering Principles and Practices. Vikas Publishers
- Pressman, R. S., & Maxim, B. R. (2020). Software engineering: a practitioner’s approach. Mcgraw-Hill Education



## DC01CF-4C2- Biometric Security

(Total Hours 60)

**Goal:** This course will familiarize the students with the systematic approaches to biometric security. The student shall be able to identify and resolve issues related to biometric securities such as fingerprint, retina, and DNA biometric

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

- Understand and analyse biometric systems at the component level
- Analyse and design basic biometric system applications
- Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
- Understand various Biometric security issues

### Teaching Learning Methodology:

Lectures, Class discussions, Coding assignments, Demonstration using various tools, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### Unit 1

Biometric fundamentals and standards: Definition, Biometrics versus traditional techniques, Characteristics, Key biometric processes: Verification - Identification - Biometric matching, Performance measures in biometric systems, assessing the privacy risks of biometrics - Designing privacy sympathetic biometric systems, Different biometric standards, and Application properties.

### Unit 2

Physiological Biometric Technologies: Fingerprints, Technical description, characteristics, Competing technologies, strengths, weaknesses, deployment, Facial scan, Technical description, characteristics, weaknesses-deployment, Iris scan, Technical description, characteristics, strengths, weaknesses, deployment

### Unit 3

Retina vascular pattern, Technical description, characteristics, strengths, weaknesses, Deployment, Hand scan, Technical description, characteristics, strengths, weaknesses deployment, DNA biometrics. Behavioural Biometric Technologies: Handprint Biometrics, DNA Biometrics.

### Unit 4

Signature and handwriting technology, Technical description, classification, keyboard / keystroke dynamics, Voice, data acquisition, feature extraction, characteristics, strengths, weaknesses, deployment.

## Unit 5

Multi biometrics and multi factor biometrics, two-factor authentication with passwords, tickets and tokens, executive decision, implementation plan.

### Suggested Reading.

- Jain, A. K., Flynn, P., & Ross, A. A. (Eds.). (2007). Handbook of biometrics. Springer Science & Business Media.
- Vacca, J. R. (2007). Biometric technologies and verification systems. Elsevier.
- Kaufman, C., Perlman, R., & Speciner, M. (1995). Network security: private communication in a public world. Ptr Prentice Hall.
- Raj Nanavathi, 1st Edition, 2002. Wiley Eastern.
- Chirillo, J., & Blaul, S. (2003). Implementing biometric security. Hungry Minds, Incorporated.
- Reid, P. (2004). Biometrics for network security. Prentice HallProfessional.

### Practicals

(Total Hours 60)

Practical's related to biometric security using some of the well-known open source software's,

- OpenBR
- Flandmark
- OpenFaceTracker
- OpenEBTS
- DeepFace
- FacePlus

With the help of these software's we can analyse the characteristics of facial images. For fingerprint analysis software's

- Soter
- Biometricauthentication
- Reprint
- Zklibrary

## DC01CF-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.

### Teaching Learning Methodology:

Lectures, Class discussions, Coding assignments, Demonstration using various software tools, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### 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, Auto boxing 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**

- Arnold, K., Gosling, J., Holmes, D., & Holmes, D. (2000). The Java programming language (Vol. 2). Reading: Addison-wesley.
- Gosling, J., Addison-Wesley, & Al, E. (2014). The Java language specification. Addison -Wesley, Cop.
- Bloch, J. (2016). Effective java. Pearson Education India.
- Horstmann, C. S., Cornell, G., & Microsystems, S. (2005). Core Java 2. Vol. 1, Fundamentals. Sun Microsystems Press
- Eckel, B. (2006). Thinking in Java. 2, Tecniche avanzate. Pearson.
- E Balagurusamy. (2015). Programming with Java: a primer. Tata Mcgraw-Hill Education (India).
- Deitel, P. J., & Deitel, H. (2012). Java How to Program. Pearson.
- Sierra, K. (2006). Head first java. O'reilly Media.
- Daniel Liang. Y., (2016). Introduction to Java programming. Pearson.
- Hubbard, J. R., (2001). Programming with Java. 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. 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 StringBuffer class like setCharAt (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.

## DC01CF-4C4 -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.

### Teaching Learning Methodology:

Lectures, Class discussions, Coding assignments, Demonstration using various software tools, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### 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

- Tanenbaum, A.S.(2003). Computer networks, 4<sup>th</sup> edn problem solutions. Prentice Hall Ptr..
- Trivedi, B. (2013). Computer networks. Oxford University Press.
- Kurose, J. F. (2005). Computer networking: A top-down approach featuring the internet, 3/E. Pearson Education India.
- Mir, N. F. (2007). Computer and communication networks. Pearson Hall.

## DC01CF-4C5- Entrepreneurship

(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.

**Teaching Learning Methodology:**

Lectures, Class discussions, Discussion groups, Student Presentation, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### 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, entrepreneurship, 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, D. F., & Rao, T. V. (2012). *Entrepreneurship: A South-Asian Perspective*. Cengage Learning.
- Hisrich, R. D., Peters, M. P., & Shepherd, D. A. (2019). *Entrepreneurship*. McGraw-Hill Education.
- Vasant Desai. (2013). *Dynamics of Entrepreneurial Development and Management*. Himalaya Publishing House.
- Dollinger, M. J. (2003). *Entrepreneurship: strategies and resources*. Prentice Hall.
- Holt, D. H. (1992). *Entrepreneurship: new venture creation*. Prentice-Hall.
- Singh, N. P. (1985). *Emerging Trends in Entrepreneurship Development: Theories and Practices, Predominantly on Indian Scene*. Intercultural Foundation for Development Management.
- Sangram Keshari Mohanty. (2010). *Fundamentals of entrepreneurship*. Phi Learning Private Ltd

## Open Elective 2

### DC01CF-4OE1 -Forensic Photography and Voice Analysis

(Total hours-30)

**Goals:** To capture evidences that is admissible in court.

**Objective:** By the end of this course, a student will

- Learn how to take photography
- Types of photography used in forensic science
- Digital photography and 3D photography
- Voice Print Identification

#### Teaching Learning Methodology

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.

#### Unit 1

Forensic Photography: Basics: Definition of photography, Basic principles and techniques, Applications of photography in forensic science.

#### Unit 2

Types of Photography, Procedures of taking photography, Tools and techniques used in photography.

#### Unit 3

Crime scene and laboratory photography, Basic concepts of videography/high speed videography, Digital photography and 3D photography, Photoshop development, super imposition techniques.

#### Unit 4

Forensic Voice analysis, Voice Print Identification, Tape Tampering Examination, ASR, Forensic Linguistics, Forensic Video Authentication.

#### Suggested Reading:

- Jauhari B.C. & Gaur S.N. (Revised 2008) – Firearms : Forensic Ballistics, Forensic Chemistry and Criminal Jurisprudence, Delhi Law House, New Delhi – 54 (India)
- Nabar B.S. - Forensic Science in Crime Investigation, Asia Law House, Hyderabad.
- Ratan Deepak & Zaidi Mohd. Hasan (2008) – Forensic Science in India and the World, Alia Law Agency, Alahabad-211 001.
- Saferstein Richard – (1978) Criminalistics: Introduction to Forensic Science, Prentice Hall of India Private Ltd., New Delhi.
- Sharma B. R. (4th Ed. 2008) - Forensic Science in Criminal Investigation and Trial, Universal Publishers
- Walls H. J. (2nd Ed. 2008), – Forensic Science: An Introduction to Scientific Crime Detection, Universal Law Publishing Co. Pvt. Ltd. New Delhi-33.
- T.Ramanujam- Prevention and Detection of crime, Madras book Agency, Madras

## DC01CF-4OE2- Criminal Laws

(Total hours-30)

**Goals:** Prevention of crime and moral support to the victims.

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

- To prevent the occurrence of crime.
- To punish the transgressors and the criminals.
- To deter the offenders from committing any criminal act in the future.

### Teaching Learning Methodology

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course

#### Unit 1

General Exceptions and Rights of Private Defense (Sec.76-106 IPC)

Offences against Human Body (Sec.299-377 IPC)

Offences against Property (Sec.378-462 IPC)

#### Unit 2

Police procedure of Arrest, Search and Seizure of property Bail- Meaning and Types, Types of bail- Bail in Non-bailable cases Intellectual Property Act.

#### Unit 3

Salient features of Indian Evidence Act (IEA), Distinction between Admission and Confession, Provision of Confession under IEA, Types of Evidence- Expert evidence -its advantages and Limitations, Burden of Proof in Criminal Cases

#### Unit 4

Procedure of investigation of a Cognizable and Non cognizable crime. Procedure of summoning of witnesses and interviewing them by the police Procedure of arrest, search and seizure of property from the suspects

#### Suggested Reading:

- Bronstein, (1999). Law for the Expert Witness, CRC Press, Boca Raton.
- Vipa, (2006). Law of Evidence, 6th Edition, Eastern Book Co., Lucknow.
- Pillia, (1983).Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai.

## **DC01CF-4OE3- Security and Vigilance in Justice System**

(Total hours-30)

**Goals:** The primary goals of the criminal justice system are: accurate identification of the person responsible, fair adjudication, retribution, deterrence, rehabilitation and restoration.

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

- retribution, deterrence, incapacitation, rehabilitation and restoration. Jurisdictions differ on the value to be placed on each.
- Retribution – Criminals ought to be punished in some way.

### **Teaching Learning Methodology**

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course

#### **Unit 1**

Concepts, definitions and importance of security system. Governmental and non-governmental security agencies their purposes, functions Vigilance in public and private sector institutions; The Central Vigilance Commission Act, 2003

#### **Unit 2**

Frauds: Nature, Types and Modus Operandi of Frauds. Extent of Frauds in Banks, Insurance and Financial Institutions Legal issues and Techniques of Combating above Frauds

#### **Unit 3**

Air Hijacking-Prevention and Detection. Security at Airport and Security Equipment, coastal security at multi- national companies Functions of Fraud analyst/ fraud investigation units

#### **Unit 4**

Stock and Share Related Crimes: Hurdles in the Investigation of Stock Crimes. White Collar Crime & Crimes about Tax Evasion procedure to analysis CCTV footages, secret cameras

### **Suggested Reading**

- Central Vigilance Commission Act, 2003 along with Related Acts
- Money – Laundering Act 2002.
- National Security Act, 1980
- National Security Guard Act, 1986
- Official Secrets Act, 1923
- Police Acts (Containing 6 Acts)
- Private Security Agencies (Regulation) Act 2005 along with Rules, 2006
- Securitization and Reconstruction of Financial Assets and enforcement of Security Interest Act, 2002 and Security Interest (Enforcement) Rules, 2002
- Sharma B. R (2008) - Bank Frauds; Prevention & Detection (3rd edition), Universal Law Publishing Co., New Delhi.

## DC01CF-5C1 -Preserving & Recovering Digital Evidence

(Total Hours 60)

**Goal:** This course will familiarize the students to learn to analyze different laws related to computer crime, how to Secure Digital Evidences, to understand the Investigation.

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

- It helps to recover, analyze, and preserve computer and related materials in such a manner that it helps the investigation agency to present them as evidence in a court of law.
- It helps to postulate the motive behind the crime and identity of the main culprit.
- Designing procedures at a suspected crime scene which helps you to ensure that the digital evidence obtained is not corrupted.
- Data acquisition and duplication: Recovering deleted files and deleted partitions from digital media to extract the evidence and validate them.

### Teaching Learning Methodology:

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, 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, Quiz, Jigsaw and crosswords.

### Unit 1

Digital Investigation: Digital evidence and computer crime, history and terminals of computer crime investigation, technology and law, the investigate process, investigate reconstruction, modus operandi, motive and technology, digital evidence in the court room.

### Unit 2

Computer basics for digital investigators: applying forensic science to computers, forensic examination of windows systems, forensic examination of unix systems, forensic examination of macintosh systems, forensic examination of handheld devices.

### Unit 3

Networks: Networks basics for digital investigators, applying forensic science to networks, digital evidence on physical and datalink layers, digital evidence on network and transport layers, digital evidence on the internet.

### Unit 4

Investigating Computer Crime: Investigating computer intrusions, investigating cyberstalking, digital evidence as alibi.

### Unit 5

Guidelines: Handling the digital crime scene – digital evidence examination guidelines.

### Suggested Reading:

- Casey, E. (2011). Digital evidence and computer crime: forensic science, computers and the Internet. Academic Press.
- Scheindlin, S. (2016). Electronic Discovery and Digital Evidence in a Nutshell. West Academic.

- Wiles, J., & Reyes, A. (2011). The best damn cybercrime and digital forensics book period. Syngress.
- Casey, E. (2011). Digital evidence and computer crime: forensic science, computers and the Internet. Academic Press.
- Vacca, J. R. (2010). Computer forensics: computer crime scene investigation. Jonesand Bartlett Publishers.

## DC01CF-5C2 –Mobile & Wireless Security

(Total Hours 60)

**Goal:** This course will familiarize the students to learn to analyze different types of mobile and wireless security and how to implement using various tools.

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

- The course will provide knowledge of information security technology and methods for communication systems that provide services for mobile users by wireless access networks.
- Knowledge and understanding of security mechanisms and protocols in wireless communication networks.
- Knowledge about some of the models, design principles, mechanisms and solutions used in wireless network security to obtain authentication and key transport protocols.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Demonstrations using various tools, Student Presentation, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### **Unit 1**

Wireless Fundamentals: Wireless Hardware, Wireless Network Protocols, Wireless Programming WEP Security. Wireless Cellular Technologies, concepts, Wireless reality, Security essentials, Information classification standards, Wireless Threats: Cracking WEP ,Hacking Techniques, Wireless Attacks, Airborne Viruses.

### **Unit 2**

Standards and Policy Solutions, Network Solutions, Software Solutions, Physical Hardware Security, Wireless Security, Securing WLAN, Virtual Private Networks, Intrusion Detection System, Wireless Public Key infrastructure. Tools, Auditing tools, Pocket PC hacking, wireless hack walkthrough.

### **Unit 3**

Security Principles, Authentication, Access control and Authorization, Non-repudiation, privacy and Confidentiality, Integrity and Auditing, Security analysis process. Privacy in Wireless World, Legislation and Policy, identify targets and roles analysis, Attacks and vulnerabilities, Analyze mitigations and protection.

### **Unit 4**

WLAN Configuration, IEEE 802.11, Physical layer, media access frame format, systematic exploitation of 802.11b WLAN, WEP, WEP Decryption script, overview of WEP attack, Implementation, Analyses of WEP attacks.

### **Unit 5**

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue

tooth Protocols. Server-side programming in Java, Pervasive web application architecture,  
Device independent example application

### **Suggested Readings**

- Russell Dean Vines. (2002). *Wireless security essentials: defending mobile systems from data piracy*. Wiley.
- Lin, Y. B., & Chlamtac, I. (2008). *Wireless and mobile network architectures*. John Wiley & Sons.
- Raj Pandya. (1999). *Mobile and personal communication services and systems*. Institute Of Electrical And Electronics Engineers.
- Swaminatha, T. M., & Elden, C. R. (2003). *Wireless security and privacy: best practices and design techniques*. Addison-Wesley.



## DC01CF-5C3- Computer Security

(Total Hours 60)

**Goal:** This course will familiarize the students to learn, analyze and understand Confidentiality, Integrity, and Availability of the organizations systems, network and data.

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

- To identify different types of authentication techniques.
- To understand and analyze different types of Compute viruses such as Trojan horse.
- To analyze different types of security attacks.
- To understand, analyze and implement different security techniques related to operating system and networks.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Coding assignments, Simulations, Demonstration using various software tools, Student Presentation, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### **Unit 1**

What Is Computer Security- Values of Assets, The Vulnerability–Threat–Control Paradigm. Threats- Confidentiality, Integrity, Availability, Types of Threats, Types of Attackers. Harm- Risk and Common Sense, Method–Opportunity–Motive. Vulnerabilities, Controls. Authentication- Identification Versus Authentication, Authentication Based on Phrases and Facts: Something You Know, Authentication Based on Biometrics: Something You Are, Authentication Based on Tokens: Something You Have, Access Control- Access Policies, Implementing Access Control, Procedure-Oriented Access Control, Role-Based AccessControl.

### **Unit 2**

Malicious Code, Malware—Viruses, Trojan Horses, and Worms, Technical Details: Malicious Code. Countermeasures for Users.

### **Unit 3**

Browser Attacks- Browser Attack Types. Web Attacks Targeting Users- False or Misleading Content, Malicious Web Content. Email Attacks-Fake Email, Fake Email Messages as Spam, Fake (Inaccurate) Email Header Data, Phishing, Protecting Against Email Attacks.

### **Unit 4**

Security in Operating Systems- Operating System Structure, Security Features of Ordinary Operating Systems, Protected Objects. Security in the Design of Operating Systems-Simplicity of Design, Layered Design, Kernelized Design, Reference Monitor

### **Unit 5**

Network Concepts- Network Transmission Media, Protocol Layers, Addressing and Routing. Threats to Network Communications, Interception, Modification, Fabrication, Interruption, Port Scanning.

## Suggested Readings

- Pfleeger, C. P. (2009). Security in computing. Pearson Education India.
- Biskup, J. (2008). Security in Computing Systems: Challenges, Approaches and Solutions. Springer Science & Business Media.
- Gollmann, D. (2010). Computer security. Wiley Interdisciplinary Reviews: Computational Statistics, 2(5), 544-554.
- Stallings, W., Brown, L., Bauer, M. D., & Bhattacharjee, A. K. (2012). Computer security: principles and practice (pp. 978-0). Upper Saddle River, NJ, USA: Pearson Education.
- Bishop, M. (2005). Introduction to computer security.

## DC01CF-5C4 -Cryptography and Cyber 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.

### Teaching Learning Methodology:

Lectures, Class discussions, Demonstration, Student Presentation, 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.

### 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

- Whitman, M. E., & Mattord, H. J. (2018). Principles of information security. Cengage Learning.
- Forouzan, B. A. (2007). Cryptography & network security. McGraw-Hill, Inc.

- Nemati, H. R. (Ed.). (2010). Applied Cryptography for Cyber Security and Defense: Information Encryption and Cyphering: Information Encryption and Cyphering. IGI Global.
- Kartalopoulos, S. V. (2006). A primer on cryptography in communications. IEEE Communications Magazine, 44(4), 146-151.
- Daras, N. J., & Rassias, M. T. (Eds.). (2015). Computation, cryptography, and network security (pp. 253-287). Springer.

## DC01CF-5C5- Data Analytics

(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.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Coding assignments, Discussion groups, Student Presentation, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### **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:**

- Budd, T. A. (2010). Exploring Python. Boston, Mass. Mcgraw-Hill.
- Downey, A., Meyer, C., & Elkner, J. (2016). How to think like a computer scientist: learning with Python. Green Tea Press.

- Perkovic, L. (2011). Introduction to computing using python: An application development focus. Wiley Publishing.

## 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 user's 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  $\geq 80$
  - b. Grade B: Percentage  $\geq 70$  and  $< 80$
  - c. Grade C: Percentage  $\geq 60$  and  $< 70$
  - d. Grade D: Percentage  $\geq 40$  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 parameters 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  $\geq 80$
  - Grade B: Percentage  $\geq 70$  and  $< 80$
  - Grade C: Percentage  $\geq 60$  and  $< 70$
  - Grade D: Percentage  $\geq 40$  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 ( $s=(v*v-u*u)/2*a$ )

## DC01CF-6C1- Security Threats & Vulnerabilities

(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

- Learn how to protect information assets against threats and vulnerabilities, to which the organization's attack surface may be exposed. Taken together, threats and vulnerabilities constitute information risk
- Analyze and understand the security objectives are met and risk mitigated will benefit an organization by contributing to: Business continuity, Operational Efficiency, Cost Effectiveness

### Teaching Learning Methodology:

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, 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.

### Unit 1

Threats and Vulnerabilities to Information and Computing Infrastructures: Internal Security Threats, Physical Security Threats, E-Mail Threats and Vulnerabilities, E-Commerce Vulnerabilities, Hacking Techniques in Wired Networks, Hacking Techniques in Wireless Networks

### Unit 2

Wireless Threats and Attacks: Wireless Threats and Attacks, Cracking WEP, Denial of Service Attacks, Network Attacks, Fault Attacks, Side-Channel Attacks.

### Unit 3

Prevention: Cryptographic Privacy Protection Techniques, Cryptographic Hardware Security Units, Client-Side Security, Server-Side Security, Protecting Web Sites, Database Security, Access Control: Principles and Solutions, Password Authentication, Computer and Network Authentication, Antivirus Technology, Biometric Basics and Biometric Authentication.

### Unit 4

Detection and Recovery: Intrusion Detection Systems Basics, Host-Based Intrusion Detection Systems, Network-Based Intrusion Detection Systems, Use of Agent Technology for Intrusion Detection, Contingency Planning Management, Computer Security Incident Response Teams (CSIRTs), Implementing a Security Awareness Program, Risk Assessment for Risk Management, Security Insurance and Best Practices. Auditing Information Systems Security, Evidence Collection and Analysis Tools, Information Leakage: Detection and Countermeasures.

### Unit 5

Management and Policy Considerations: Digital Rights Management, Web Hosting, Multilevel Security, Multilevel Security Models, Guidelines for a Comprehensive Security System.

### Suggested Readings

- Hossein Bidgoli. (2006). Handbook of information security. Volume 3, Threats, vulnerabilities, prevention, detection, and management. John Wiley.
- Fennelly, L. (2019). Handbook of Loss Prevention and Crime Prevention. Butterworth-Heinemann Inc.
- Tipton, H. F., & Micki Krause Nozaki. (2019). Information security management handbook. Volume 2. Auerbach.



## DC01CF-6C2 – Ethical Hacking and Digital Forensics

(Total Hours 60)

**Goal:** The aim of this course is to equip you with the knowledge and techniques to computer forensics practices and evidence analysis. It also aims at increasing the knowledge and understanding in cyber security and ethical hacking.

**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.

### **Teaching Learning Methodology:**

Lectures, Class discussions, Coding assignments, Demonstrations using various tools, Student Presentation, Textbook assignment, Problem solving or case studies. Use of flip chart board by instructor as aid in teaching.

### **Unit 1**

Wireless Fundamentals: Wireless Hardware, Wireless Network Protocols, Wireless Programming WEP Security. Wireless Cellular Technologies, concepts, Wireless reality, Security essentials, Information classification standards, Wireless Threats: Cracking WEP, Hacking Techniques, Wireless Attacks, Airborne Viruses.

### **Unit 2**

Standards and Policy Solutions, Network Solutions, Software Solutions, Physical Hardware Security, Wireless Security, Securing WLAN, Virtual Private Networks, Intrusion Detection System, Wireless Public Key infrastructure. Tools, Auditing tools, Pocket PC hacking, wireless hack walkthrough.

### **Unit 3**

Security Principles, Authentication, Access control and Authorization, Non-repudiation, privacy and Confidentiality, Integrity and Auditing, Security analysis process. Privacy in Wireless World, Legislation and Policy, identify targets and roles analysis, Attacks and vulnerabilities, Analyze mitigations and protection.

### **Unit 4**

WLAN Configuration, IEEE 802.11, Physical layer, media access frame format, systematic exploitation of 802.11b WLAN, WEP, WEP Decryption script, overview of WEP attack, Implementation, Analyses of WEP attacks.

### **Unit 5**

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Server-side programming in Java, Pervasive web application architecture, Device independent example application

## Suggested Readings:

- Russell Dean Vines. (2002). Wireless security essentials: defending mobile systems from data piracy. Wiley.
- Peikari, C., & Fogie, S. (2003). Maximum wireless security. Sams Pub.
- Crosbie, M. (2015). Hack the cloud: Ethical hacking and cloud forensics. In Cloud Technology: Concepts, Methodologies, Tools, and Applications (pp. 1510-1526). IGI Global.

## Practical's:

(Total Hours 60)

Practical's using some of the well-known software's

FTK Images

Xplico

The Sleuth kit

Kali linux and its tools

The following exercises have to be performed using various software tools/ utilities mentioned

Software Tools:

1. CyberCheck 4.0 - Academic Version
2. CyberCheckSuite
3. MobileCheck
4. Network Session Analyser
5. Win-LiFT
6. TrueImager
7. TrueTraveller
8. PhotoExaminer Ver 1.1
9. CDRAnalyzer

Forensics Exercises:

I) Disk Forensics:

1. Identify digital evidences
2. Acquire the evidence
3. Authenticate the evidence
4. Preserve the evidence
5. Analyze the evidence
6. Report the findings

II) Network Forensics: • Intrusion detection • Logging (the best way to track down a hacker is to keep vast records of activity on a network with the help of an intrusion detection system) •

Correlating intrusion detection and logging

III) Device Forensics

1. PDA
2. Mobile phone
3. Digital Music
4. Printer Forensics
5. Scanner Forensics

## DC01CF-6C3- Computer Forensics

(Total Hours 60)

**Goal:** The aim of computer forensics is to examine digital devices in a constructive way with the goal of identifying, preserving, recovering, analyzing, and presenting the evidence in a court of law.

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

- To understand the basics about digital forensics.
- To understand about handling of digital crime scene.
- To understand about digital investigation and evidence.
- To apply digital forensics to networks for providing security.

### Teaching Learning Methodology:

Lectures, Class discussions, Student Presentation, Textbook assignment, Problem solving or case studies. Demonstration and Simulation.

### Unit 1

Foundations of Digital Forensics, Digital Evidence, Increasing Awareness of Digital Evidence, Digital Forensics: Past, Present, and Future, Principles of Digital Forensics, Challenging Aspects of Digital Evidence, Following the Cyber trail. Language of Computer Crime Investigation, The Role of Computers in Crime.

### Unit 2

Conducting Digital Investigations-Digital Investigation Process Models, scaffolding for Digital Investigations, Applying the Scientific Method in Digital Investigations, Investigative Scenario: Security Breach. Handling a Digital Crime Scene- Published Guidelines for Handling Digital Crime Scenes, Fundamental Principles, Authorization, preparing to Handle Digital Crime Scenes, Surveying the Digital Crime Scene, Preserving the Digital Crime Scene.

### Unit 3

Investigative Reconstruction with Digital Evidence- Equivocal Forensic Analysis, Victimology, Crime Scene Characteristics, Threshold Assessments. Axes to Pathological Criminals and Other Unintended Consequences, Modus Operandi, Technology and Modus Operandi, Motive and Technology, Current Technologies.

### Unit 4

Digital Evidence as Alibi- Investigating an Alibi, Time as Alibi, Location as Alibi. Applying Forensic Science to Computers- Preparation, Survey, Documentation, Preservation, Examination and Analysis, Reconstruction, Reporting.

### Unit 5

Applying Forensic Science to Networks- preparation and Authorization, Identification, Documentation, Collection, and Preservation, Filtering and Data Reduction, Class/Individual Characteristics and Evaluation of Source, Evidence Recovery, Investigative Reconstruction, Reporting Results.

### Suggested Readings:

- Casey, E. (2011). Digital evidence and computer crime: forensic science, computers and the Internet. Academic Press.
- Vacca, J. R. (2010). Computer forensics: computer crime scene investigation. Jones and Bartlett Publishers.

- Kruse II, W. G., & Heiser, J. G. (2001). Computer forensics: incident response essentials. Pearson Education.
- Nelson, B., Phillips, A., & Steuart, C. (2014). Guide to computer forensics and investigations. Cengage Learning.
- Solomon, M. G., Rudolph, K., Tittel, E., Broom, N., & Barrett, D. (2011). Computer forensics jumpstart. John Wiley & Sons.

## DC01CF-6C4 – 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

### **Teaching Learning Methodology:**

Lectures, Class discussions, reading assignments, Discussion groups, Student Presentation, Textbook assignment, 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, Quiz, Jigsaw and crosswords.

### **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 Cyber Security and Cyber Forensics

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.

**DC01CF-6C5 Ethics in Information Technology and Computer Communication  
(Total Hours 30)**

**Goal:** To develop ethics related to computer profession and development.

**Course Objective:** Objective of this course is to expose the students

- To ensure the privacy and safety of the computer users.
- To help people, use the computer in the right ways.
- To guarantee that the works that done by someone did not declare by other people.

**Teaching Learning Methodology:**

Lectures, Class discussions, Discussion groups, Student Presentation, case studies. Use of flip chart board by instructor as aid in teaching.

**Unit 1: Risk and Responsibility**

In this segment of the course we evaluate the risks of computer technology. Some of these risks are the results of imperfections in the technology itself, while others are the consequence of human misunderstandings and misinterpretations. We will ask questions such as: how to assess the gravity of risks against the clear benefits of computer technology? Who bears the risks and who should be making the decisions about whether they are acceptable? Is computer technology in any way a unique technology in the nature and extent of the risks it poses?

Following the discussion of risk, we examine responsibility. Who is responsible for risks and harms caused by computing? What are the special responsibilities, if any, of computer professionals? Beyond the responsibility to produce systems that work, do computer professionals have a social responsibility to see that their technology is used only for the betterment of society? We will apply legal and philosophical concepts to these discussions.

**Unit 2: Ethical Theory**

Ethical theories and concepts from the Western philosophical tradition offer ways to analyze and clarify practical questions about values and information technology. In this segment of the course we review two basic approaches to ethical theorizing: deontology and consequentialism. We also study the concept of rights and justice. These enhance our understanding of the many issues in information technology ethics that are framed in terms of "rights": the right to own software, the right to privacy, and the right to benefit from computing. We also examine the relationship between law and morality. The theoretical approaches and concepts will be applied and developed throughout the rest of the course.

**Unit 3: Intellectual Property and Computer Software**

Is it wrong to make unauthorized copies of software? Should software be free? Is the patenting of software good for society? These are some of the questions addressed in this section on the private ownership of computer software. Although much of the scholarly work in the area of software ownership is concerned with detailed legal questions, we will focus on its philosophical and ethical aspects.

#### **Unit 4: Privacy and Information Technology**

Poll after poll show that Americans are concerned about the erosion of their privacy. They think the government knows too much about them and they are becoming increasingly aware of the many other institutions that have access to their records. Information technology is at the heart of many of these intrusions on privacy. This section of the course examines the use of computerized record-keeping and its effects on privacy. Drawing on moral and legal understandings of privacy, it evaluates the claims by individuals in technologically advanced societies to be free of surveillance.

#### **Unit 5: Crime by Computer**

Reports of computer crime elicit a mixture of reactions. On the one hand, people are worried about how vulnerable society's computerized infrastructure is to infiltration and destruction. On the other, they are impressed by the ingenuity of the so-called "hackers." How should we regard infiltration onto computer systems? What computer crimes are really bad? Are hackers mere villains or are they Robin Hoods?

#### **Unit 6: The Networked World**

More than any other application of computer technology, digital networks have captured the public's fascination and imagination. But is all of the attention warranted? Will computer networks transform society, revolutionize social institutions, remake communities and the political landscape, and change the world economy; or will they merely provide new outlets for consumerism and entertainment? How much should society invest in the new networks? Should the government ensure universal access to networks even to those who cannot afford to pay the cost?

The final segment of the course will discuss these questions and others. It will evaluate debates about civil liberties, like free speech, on the internet. What rules should govern behavior on the internet? We will also consider the effects that networks may have on fundamental values such as privacy and property.

#### **Suggested Readings:**

- Johnson, D. G. (1985). *Computer ethics*. Englewood Cliffs (NJ).
- Bynum, T. W. (2001). Computer ethics: Its birth and its future. *Ethics and Information Technology*, 3(2), 109-112.
- Bynum, T. W., & Simon, R. (2004). *Computer ethics and professional responsibility*.



## Timetable – I Semester BCA (Cyber Forensics, Data Analytics And Cyber Security)

	I	II		III	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30 am - 11.45 am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Fundamentals of Information Technology	Computer System Architecture	<b>Sna</b>	Soft Skills & Business Communication	<b>Lun</b>	Fundamentals of Information Technology(lab )	
<b>Tuesday</b>	Soft Skills & Business Communication	Basic Mathematics & Statistics		Fundamentals of Information Technology		Computer System Architecture (lab)	
<b>Wednesday</b>	Fundamentals of Information Technology	Computer System Architecture		Basic Mathematics & Statistics		Fundamentals of Information Technology(lab )	
<b>Thursday</b>	Computer System Architecture	Soft Skills & Business Communication		Fundamentals of Information Technology		Computer System Architecture (lab)	
<b>Friday</b>	Computer System Architecture	Basic Mathematics & Statistics		SRCE		Fundamentals of Information Technology(lab )	

<b>Saturday</b>	Basic Mathematics & Statistics	Soft Skills & Business Communication		SRCE		Computer System Architecture (IAb)
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## Timetable – II Semester BCA (Cyber Forensics, Data Analytics And Cyber Security)

	I	II		III	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30 am - 11.45 am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Programming Fundamentals using C++	DBMS	<b>Snack Break</b>	Statistical techniques with R	<b>Lunch Break</b>	DBMS(lab)	
<b>Tuesday</b>	EVS	DBMS		Programming Fundamentals using C++		Programming Fundamentals using C++(LAB)	
<b>Wednesday</b>	Programming Fundamentals using C++	Statistical techniques with R		EVS		DBMS(lab)	
<b>Thursday</b>	DBMS	Statistical techniques with R		Programming Fundamentals using C++		Programming Fundamentals using C++(LAB)	
<b>Friday</b>	DBMS	EVS		Open elective-I		DBMS(lab)	
<b>Saturday</b>	Programming Fundamentals using C++	Statistical techniques with R		Open elective-I		Programming Fundamentals using C++(LAB)	

**Timetable – III Semester BCA (Cyber Forensics, Data Analytics And Cyber Security)**

	I	II		III	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30 am - 11.45 am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Introduction to cyber forensics and cyber laws	Data Structures	<b>Sn</b>	Operating System	<b>L</b>	OS (lab)	
<b>Tuesday</b>	Data Structures	Operating System		Introduction to cyber forensics and cyber laws		Web development (lab)	
<b>Wednesday</b>	Research Methodology	Data Structures		Library		OS (lab)	
<b>Thursday</b>	Research Methodology	Introduction to cyber forensics And cyber laws		OS (lab)		Web development (lab)	
<b>Friday</b>	Data Structures	Operating System		Web development (lab)		OS (lab)	

<b>Saturday</b>	Operating System	Introduction to cyber forensics and cyber laws		Mentoring		Web development (lab)
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## Timetable – IV Semester BCA (Cyber Forensics, Data Analytics And Cyber Security)

	I	II		III	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30am - 11.45am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Biometric security	Software engineering	<b>Snack Break</b>	Programming in java	<b>Lunch Break</b>	Java ( lab)	
<b>Tuesday</b>	Programming in java	Computer networks		Entrepreneurship		Biometric security (Lab)	
<b>Wednesday</b>	Software engineering	Biometric security		Open elective- II		Java ( lab)	
<b>Thursday</b>	Computer networks	Programming in java		Software engineering		Biometric security (Lab)	
<b>Friday</b>	Biometric security	Entrepreneurship		Open elective- II		Java ( lab)	
<b>Saturday</b>	Programming in java	Software engineering		Biometric security		Biometric security (Lab)	

## Timetable – V Semester BCA (Cyber Forensics, Data Analytics and Cyber Security)

	I	I I		II I	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30 am - 11.45 am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Preserving And Recovering Digital Evidences	Mobile And Wireless Security	Snack Break	Computer Security	Lunch Break	Data Analytics (lab)	
<b>Tuesday</b>	Mobile And Wireless Security	Cryptography And Cyber Security		Data Analytics		Data Analytics	Library
<b>Wednesday</b>	Computer Security	Mobile And Wireless Security		Preserving And Recovering Digital Evidences		Data Analytics (lab)	
<b>Thursday</b>	Cryptography And Cyber Security	Data Analytics		Mobile And Wireless Security		Data Analytics (lab)	
<b>Friday</b>	Computer Security	Preserving And Recovering Digital Evidences		Cryptography And Cyber Security		Data Analytics (lab)	
							Data Analytics

<b>Saturday</b>	Computer Security	Cryptography And Cyber Security		Preserving And Recovering Digital Evidences		Mentoring	
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## Timetable – VI Semester BCA (Cyber Forensics, Data Analytics And Cyber Security)

	I	I I		II I	IV	V	VI
	9.30am - 10.30am	10.30am - 11.30am	11.30 am - 11.45 am	11.45am - 12.45pm	12.45pm - 1.45pm	01.45pm - 2.45pm	2.45pm - 3.45pm
<b>Monday</b>	Security Threats And Vulnerabilities	Ethical Hacking And Digital Forensics	<b>Snack Break</b>	Computer Forensics	<b>Lunch Break</b>	Ethical Hacking And Digital Forensics (Lab)	
<b>Tuesday</b>	Computer Forensics	Security Threats And Vulnerability		Library		Ethical Hacking And Digital Forensics (Lab)	
<b>Wednesday</b>	Ethical Hacking And Digital Forensics	Security Threats And Vulnerabilities		Computer Forensics		Ethical Hacking And Digital Forensics (Lab)	
<b>Thursday</b>	Ethical Hacking And Digital Forensics	Computer Forensics		Ethics		Project	
<b>Friday</b>	Security Threats And Vulnerabilities	Ethical Hacking And Digital Forensics		Ethics		Project	
<b>Saturday</b>	Project			Project		Project	



## The Yenepoya Institute of Arts, Science, Commerce and Management, Balmatta, Mangalore

### Undergraduate Programme Academic Calendar for the admission year 2020-21

Name of the Course: -	
<ol style="list-style-type: none"> <li>1. B. Com (Finance, Taxation and Auditing)</li> <li>2. B. Com (International Management Accounting)</li> <li>3. B. Com(Honors) (International Accounting and Finance)</li> <li>4. B. Com (Honors) (Aviation and Logistics)</li> <li>5. BBA (Aviation &amp; Logistics)</li> <li>6. BBA (Aviation, Travel &amp; Tourism)</li> <li>7. BBA (Entrepreneurship, International Business and Business Analytics)</li> <li>8. BBA (Journalism, Media, event and Communication)</li> <li>9. BBA (Logistics and Port Management)</li> <li>10. BCA (Big Data Analytics and Cloud Computing)</li> <li>11. B.Sc. Hospitality Science (Aviation, Travel and Tourism)</li> <li>12. B.Sc, Food Science and Nutrition</li> <li>13. B.Sc (Honours) Forensic Science</li> <li>14. BCA (Cyber Forensic, Data Analytics and Cyber Security)</li> <li>15. BCA (Robotics, Machine Learning and Artificial Intelligence)</li> </ol>	
Name of the Events	Stream
Orientation Programme	14-09-2020
<b>I Semester</b>	
University Induction Programme	15-09-2020
YIASCM Induction Programme	16-09-2020
Introduction of the subjects	17-09-2020
Introduction to faculty, Clubs, Co-curricular activities and Personal and Professional development Programme	18-09-2020
<b>Commencement of classes</b>	21-09-2020
Internal Exam	3 <sup>rd</sup> week of November 2020
Co curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	4 <sup>th</sup> week of November 2020
Parents Teacher Students Meeting	1 <sup>st</sup> week of December 2020
<ol style="list-style-type: none"> <li>1. Last date for payment of exams fees without fine</li> <li>2. With fine of Rs. 200</li> <li>3. With fine of Rs. 500</li> </ol>	1 <sup>st</sup> month before the exams 3 <sup>rd</sup> weeks before the exams 2 <sup>nd</sup> weeks before the exams
Commencement of University Examinations Theory Exam	4 <sup>th</sup> week of January 2021
Declaration of University Exam Results	4 <sup>th</sup> week of February 2021
<b>Commencement of classes for II Semester</b>	22-02-2021
Student council installation programme	1 <sup>st</sup> week of March 2021
Internal Exam	2 <sup>nd</sup> week of April 2021
Co curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	3 <sup>rd</sup> week of April 2021
Parents Teacher Students Meeting	4 <sup>th</sup> week of April 2021
<ol style="list-style-type: none"> <li>1. Last date for payment of exams fees without fine</li> <li>2. With fine of Rs. 200</li> <li>3. With fine of Rs. 500</li> </ol>	1 month before the exams 3 weeks before the exams 2 weeks before the exams
Commencement of University Examinations Theory Exam	1 <sup>st</sup> week July 2021

Declaration of University Exam Results	1 <sup>st</sup> week August 2021
<b>Commencement of classes for III Semester</b>	<b>05.08.2021</b>
Internal Exam	2 <sup>nd</sup> week of September 2021
Co curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	3 <sup>rd</sup> week of September 2021
Parents Teacher Students Meeting	4 <sup>th</sup> week of September 2021
Study leave	
1. Last date for payment of exams fees without fine 2. With fine of Rs. 200 3. With fine of Rs. 500	1 month before the exams 3 weeks before the exams 2 weeks before the exams
Commencement of University Examinations Theory Exam	1 <sup>st</sup> week of December 2021
Declaration of University Exam Results	1 <sup>st</sup> week of January 2022
<b>Commencement of classes for IV Semester</b>	<b>03.01.2022</b>
Internal Exam	2 <sup>nd</sup> week of March 2022
Co curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	3 <sup>rd</sup> week of March 2022
Parents Teacher Students Meeting	4 <sup>th</sup> week of March 2022
1. Last date for payment of exams fees without fine 2. With fine of Rs. 200 3. With fine of Rs. 500	1 month before the exams 3 weeks before the exams 2 weeks before the exams
Commencement of University Examinations Theory Exam	1 <sup>st</sup> week of May 2022
Declaration of University Exam Results	1 <sup>st</sup> week of June 2022
<b>Commencement of classes for V Semester</b>	<b>04.07.2022</b>
Internal Exam	2 <sup>nd</sup> week of September 2022
Co-curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	3 <sup>rd</sup> week of September 2022
Parents Teacher Students Meeting	4 <sup>th</sup> week of September 2022
1. Last date for payment of exams fees without fine 2. With fine of Rs. 200 3. With fine of Rs. 500	1 month before the exams 3 weeks before the exams 2 weeks before the exams
Commencement of University Examinations Theory Exam	1 <sup>st</sup> week of November 2022
Declaration of University Exam Results	1 <sup>st</sup> week of December 2022
<b>Commencement of classes for VI Semester</b>	<b>04.01.2023</b>
Internal Exam	2 <sup>nd</sup> week of March 2023
Co-curricular activities (Fine Arts Association, Commerce Association, Language Association, NSS, Sports, Management Association, IT Club etc.,)	3 <sup>rd</sup> week of March 2023
Parents Teacher Students Meeting	4 <sup>th</sup> week of March 2023
1. Last date for payment of exams fees without fine 2. With fine of Rs. 200 3. With fine of Rs. 500	1 month before the exams 3 weeks before the exams 2 weeks before the exams
Commencement of University Examinations Theory Exam	1 <sup>st</sup> week of May 2023
Declaration of University Exam Results	1 <sup>st</sup> week of June 2023