ST. TERESA'S COLLEGE (AUTONOMOUS) ERNAKULAM

Affiliated to Mahatma Gandhi University, Kottayam

CURRICULUM AND SYLLABI FOR THE PROGRAMME BCA
(CLOUD TECHNOLOGY AND INFORMATION SECURITY MANAGEMENT)
Program Code: BCAC

Under Choice Based Credit & Semester System
(2023 Admission Onwards)

St. Teresa's College (Autonomous), Ernakulam
Department of Computer Applications
Board of Studies in Computer Applications (2021-2024)

Sl. No	Category	Name	Designation	Official Address
1	Chairperson	Dr. Sabu M K	Professor	Department of Computer Applications, Cochin University of Science and Technology, Cochin -22
2	Faculty Member	Mrs.Raji S Pillai	HOD, Assistant Professor	Department of Computer Applications, St.Teresa's College (Autonomous), Ernakulam
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6	Faculty Member	Ms. Mekha Jose	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
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8	Faculty Member	Ms. Veena Antony	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
9	Faculty Member	Ms. Mary Andrews	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
10	Faculty Member	Ms. Elizabeth Paul	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
11	Faculty Member	Ms. Harsha K M	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
12	Faculty Member	Ms. Megha George	Assistant Professor	Department of Computer Applications

				St Teresa's College (Autonomous) Ernakulam
13	Faculty Member	Ms. Anjali Menon	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous) Ernakulam
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15	Subject Expert- 1 Outside MG University	Dr. Remesh Babu	Professor	Department of Information Technology, GEC Palakkad, Sreekrishnapuram
16	Subject Expert- 2 Outside MG University	Dr. Binu P Chacko	Principal & Research Guide	Computer Science Department Prajyoti Niketan College Puthukad, Thrissur
17	University Nominee	Dr. Jaseena K U	Assistant Professor	Department of Computer Applications MES College, Marampilly, Aluva
18	Representative from Industry/ Corporate Sector/ Allied field related to placement	Mr. Saj Janin J	Principal Architect	Cognizant Technology Solution, Kochi
19	Alumni Representative	Mrs. Sebby K X	Sr. HSST	EMGHS, FortKochi

PREFACE

The curriculum, which encompasses the totality of student experience, should ensure a collective and dedicated effort to birth an inspiring academic culture in a campus. It is this vision of quality knowledge, its production and transmission, that has fueled the Teresian quest for essential and elemental student development. St. Teresa's College has taken meticulous care in the conception of the new well-balanced curriculum by retaining the fundamental prerequisites mentioned by the University/Higher Education Council. With the constraints of a prescribed syllabus in mind, we have created an academic sanctuary, where a deeper access to knowledge is achievable to students and teachers as well.

The Syllabus restructuring of 2023 instigates opportunities of real-world learning to equip a modern scholar with the practicality of experience. As an autonomous institution under Mahatma Gandhi University, St. Teresa's College offers a significant number of Programmes with definite placement windows to the learners. Student knowledge and training across a range of subject areas is efficiently enriched by engaging them in work-based learning, as provided by the revised and restructured curriculum.

The indefatigable effort taken by the teachers in developing Programmes and Course outcomes is commendable. The blossoming of the cognitive and intellectual skills of the scholars, the initiation of a research mentality, and pragmatic skill sets to venture out confidently into a professional space, are the core off-shoots that are anticipated. The curriculum should equip the students to be educators themselves, with a voice that echoes global effectiveness.

I congratulate the efforts taken by the Principal Dr. Alphonsa Vijaya Joseph and her team for restructuring the syllabus in keeping with the latest demands in academia. We trust that the syllabus will transform minds to embark upon higher academic summits and thereby mold learners who will make significant contributions to the world. We look forward to sharing the outcomes of our restructured curriculum and the positive changes that would reshape the academic lives of all our scholars.

Dr. Sr. Vinitha

Manager

FOREWORD

The most significant characteristic of an autonomous college is its commitment tocurriculum renewal or revision. Academic autonomy has granted the college the freedom to fine tune the syllabus keeping in mind the changing needs of the new generation of students, the new educational scenario in the global context and incorporation of skill-based curricula. Revision of the syllabus implies responsibility and accountability and this in turn leads to excellence in academics and proactive governance. Education in the current scenario throws up a multitude of challenges and the curricula and syllabi ought to reflect the paradigm shift that has occurred in the various disciplines.

A revision of the syllabus is implemented by modifying the curriculum after review to evaluate the effectiveness of the curriculum after it has been implemented and to reflect on what students did and did not get out of it. In line with the new educational policy, a big educational reform can be affected by restructuring of syllabi to maintain a high level of quality in the standard of education that we impart.

The three themes under Higher Education relevant to policy initiative for restructuring of the curriculum i.e., integrating skill development in higher education, linking higher education to society and integration of new knowledge are considered with utmost importance during revision of the syllabus.

Outcome-Based Education emphasizes that the learning process is innovative, interactive and effective, where the main goal is student achievement at the end of the learning period. St. Teresa's College in its pursuit of imparting quality education has adopted Outcome Based Education (OBE) system that involves restructuring of curriculum, academic processes, teaching methodologies, assessment and evaluation systems in education to reflect the achievement of high order learning. It is a student-centric instruction model that focuses on measuring student performance through outcomes that include knowledge, skills and attitudes.

The revised syllabus and curriculum are the result of the combined efforts of the members of the Board of studies, curriculum expert committee and the syllabus committee who worked as a team to revise the syllabus and curriculum in the stipulated period. Active consultations were held with various stakeholders to elicit multiple perspectives in higher education which were incorporated in the new curriculum.

With sincere gratitude I acknowledge the instinct support and constant guidance extended by Rev. Dr. Sr. Vinitha, Provincial Superior and Manager, Rev. Sr. Emeline, Director, Dr. Sajimol Augustine M., Senior Administrator, Smt. Betty Joseph, Vice-Principal and Dr. Beena Job, Dean of self-financed programmes. I specially thank the team headed by Dr. Betty Rani Isaac, the Heads of the Departments and all the faculty members for their diligence, commitment and exceptional contribution towards this endeavour.

Dr. Alphonsa Vijaya Joseph
PRINCIPAL

ACKNOWLEDGEMENT

I acknowledge with gratitude all the guidance and help given by our Manager, Rev. Dr.Sr. Vinitha CSST, Principal Dr. Alphonsa Vijaya Joseph, Director Rev. Sr. Emeline CSST, Senior Administrator, Dr. Sajimol Augustine M, Vice Principal Ms. Betty Joseph and Dean of Self-Financing Programmes Dr. Beena Job during the course of restructuring of the syllabi. I also remember and acknowledge with gratitude all the members of the Board of Studies of Computer Applications for their constructive suggestions and contributions in restructuring the syllabi of all the courses in BCA(Cloud Technology and Information Security Management). I am also grateful to all the members of the Curriculum Committee and the Syllabus Restructuring Committee of the college for their guidance during the syllabus restructuring process. Above all, I bow my head before God Almighty for all the guidance he has continuously given to us all our endeavours.

Ms. Raji S Pillai
Head of the Department
St. Teresa's College (Autonomous), Ernakulam

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PREAMBLE

The department of Computer Applications of St. Teresa's College is proposed to start a new course with dual Specialization in Cloud Technology and Information Security Management. As St. Teresa's College is granted academic autonomy in the year 2014, hence it has the privilege of restructuring the syllabus. Keeping an eye on the industry and to modernize the curriculum, the Board of Studies members of the Department of Computer Applications, St.Teresas College, has initiated an industry collaboration to impart Bachelor of Computer Applications (dual specialization) programme in Cloud Technology and Information Security Management. The main objective of this program is to inculcate among the students, the technical as well as the theoretical knowledge about the computers and its various applications in different fields. The curriculum and syllabi of this programme are at par with those of the reputed in situations across India and abroad. This programme is designed in such a way that students can have a detailed knowledge of subjects as well as the knowledge of IT related applications. Throughout this programme the students will go through the IT scenario, its scope, career and the essentials of the IT world. This programme equips the students with practical understanding of cloud technology and information security concepts and theories from an industry perspective. This unique course provides dual career options for the students in the latest and fast-growing technology sectors of Cloud Technology and Information Security. The syllabus aims to focus on enabling the students to familiarize with the new technologies, and at the same time enhance and strengthen the fundamental knowledge in Cloud Technology and Information Security.

Outcome based education involves assessment and evaluation practices in education reflecting the attainment of expected learning and mastery in the programme. It is a systematic way to determine if a programme has achieved its goal. This approach of learning makes the student an active learner, the teacher a good facilitator and together they lay the foundation for life-long learning. The process includes framing of specific course outcomes at various appropriate levels of taxonomy, mapping the course outcomes of each course with the Programme Specific Outcomes and finally calculating the course attainment based on the marks scored by the student in both the Internal and External assessments.

PROGRAMME OUTCOMES (PO)

On completion of an undergraduate programme from St. Teresa's College (Autonomous) Ernakulam, students should be able to demonstrate the programme outcomes listed below:

PO 1. *Disciplinary knowledge*

- Demonstrate a mastery of the fundamental knowledge and skills required in the discipline to function effectively as an entry-level professional in the field.

PO 2. *Scientific Temper*

- Experiment with new approaches, challenge existing knowledge boundaries and take informed action to solve problems related to society.
- Identify, define, and deal with problems through logical, analytical and critical thinking acquired from different domains of knowledge

PO 3. *Research and Digital Competence*

- Develop a research culture for lifelong learning and demonstrate competency in creating new knowledge.
- Analyze and choose from available data and information sources to communicate, collaborate and network through a range of digital media.

PO 4. *Communication Skills*

- Develop language proficiency through interactions embedded in meaningful contexts.
- Demonstrate communicative competence particularly using technology in social and global environments.

PO 5. *Leadership, Teamwork and Interpersonal Skills*

- Function effectively both as leader and/or member of a team.
- Collaborate and interact effectively with others.

PO 6. *Moral & Ethical Awareness and Social Responsibility*

- Demonstrate social and national responsibility.
- Engage in activities that contribute to the betterment of society, with a preferential option for the economically challenged and the marginalized.

BCAC- BCA (Cloud Technology and Information Security Management)

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of the BCA (Cloud Technology and Information Security Management) programme, students should be able to demonstrate the programme specific outcomes listed below:

PSO1: Describe the concepts and organization of computer, network and data management systems incorporating security practices. (Understand)

PSO2: Integrate critical thinking, mathematical, statistical and collaborative learning skills to solve abstract to complex problems using high-level programming languages. (Create)

PSO3: Identify the cloud computing concepts and technologies and apply these in a cloud platform. (Apply)

PSO4: Apply cyber security policies and strategies to protect and investigate malpractices against digital assets. (Apply)

PSO5: Develop solutions to real world problems by coalescing computer technologies and risk management principles in a multidisciplinary environment and communicate it effectively. (Create)

ELIGIBILITY

Admission to the BCA (Cloud Technology and Information Security Management) Degree Programme shall be open to candidates who have passed the Plus Two Examination (Science Stream) with Mathematics/Computer Science/ Informatics Practices recognized by this University.

PROGRAMME DESIGN

The B.C.A in Cloud Technology and Information Security Management includes,

a. Common Courses

b. Core Courses

c. Choice Based Core Courses

d. Complementary Courses

e. Open Courses

f. Seminar

g. Project

h. Viva Voce.

No course shall carry more than 4 credits except Project. The student shall select any Choice based core course offered by the department which offers the core courses, depending on the availability of teachers and infrastructure facilities, in the institution. Open courses shall be Offered in any subject and the student shall have the option to do courses offered by other departments.

PROGRAMME STRUCTURE

BCA (CLOUD TECHNOLOGY & INFORMATION SECURITY MANAGEMENT)

A	Programme Duration	6 Semesters
B	Total Credits required for successful completion of the Programme	120
C	Credits required from Common Courses	8
D	Credits required from Core Courses	80
E	Credits required from Choice Based Core Courses	4
F	Credits required from Complementary Courses	20
G	Credits required from Open Course	3
H	Credits required from Seminar	1
I	Credits required from Project	3
J	Credits required from Viva Voce	1

COURSES

The Programme consists of common courses with 8 credits, core courses, choice based core course, complementary courses with 109 credits and open course with 3 credits.

SCHEMES OF COURSES

The different types of courses and its number is as follows:

Sl.No	Category	No. of Courses	Credits
1	Common Courses	2	8
2	Core Courses	25	80
3	Choice Based Core Courses	1	4
4	Complementary Courses	5	20
5	Open Courses	1	3
6	Seminar	1	1
7	Project	1	3
8	Viva Voce	1	1
	Grand Total	37	120

SCHEME OF DISTRIBUTION OF INSTRUCTIONAL HOURS FOR CORE COURSES

Semester	Model III	
	Theory	Practical
First	8	4
Second	8	4
Third	16	5
Fourth	16	5
Fifth	16	5
Sixth	20	5(Project)

COURSE CODE FORMAT

The programme is coded according to the following criteria.

1. The first letter plus second letter from the programme ie., **BC**
2. One digit to indicate the semester. i.e., **BC1 (BCA, 1st semester)**
3. One letter from the type of courses such as, **A** for common course, **B** for Complementary course, **C** for core course, **D** for Open course, ie.., **BC1C (BCA, 1st semester Core course)** and **PR** for project, **S** for Seminar, **V** for Viva Voce.
4. Two digits to indicate the course number of that semester. ie.., **BC1C01 (BCA, 1st semester, Core course, course number is 01)**
5. The letter **B** to indicate Bachelors Programme.
6. **BC1C01B** (Computer, 1st semester, Core course, courses number 01, and **B** for bachelors Programme)
7. **23 to indicate the year.** ie.., **BC1C01B23**
8. The letter **P** denotes practical – it should come after the code letter for the course ie **CP** (core practical-eg. BC2CP01B23)

9. Main Project: BC6PRB23, Seminar: BC6CSB23, VivaVoce: BC6CVB23

10. The letter I denotes internship– It should come after the code letter for the course ie., CI (Core Internship-eg. BC2CI01B23)

DURATION OF PROGRAMME

- The duration of U.G. Programmes shall be 6 semesters.

- A student may be permitted to complete the programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

- Attendance: Students having a minimum of 75% average attendance for all the courses only, can register for the examination.

DETAILED PROGRAMME STRUCTURE

BCA (Cloud Technology and Information Security Management)

Semester	Course Type	Course Code	Title of the Course	No of Hrs/ Week	Credits	Total Hrs / Sem	Total Marks	
							ISA	ESA
I	Common Course	EN1A01B23	Fine-tune Your English	5	4	90	20	80
	Complementary Course	BC1B01B23	Computer Fundamentals and Organization	4	4	72	20	80
	Core Course	BC1C01B23	Programming in C	4	3	72	20	80
	Core Course	BC1C02B23	Linux Administration	4	3	72	20	80
	Core Course	BC1CP01B23	Software Lab-I	4	2	72	20	80
	Complementary Course	ST1B01B23	Descriptive Statistics	4	4	72	20	80
	TOTAL HOURS AND CREDIT			**25**	**20**			
II	Common Course	EN2A03B23	Issues that Matter	5	4	90	20	80
	Complementary Course	BC2B02B23	Operating system	4	4	72	20	80
	Core Course	BC2C03B23	OOPS with C++	4	3	72	20	80
	Core Course	BC2C04B23	Data structures using C	4	3	72	20	80
	Core Course	BC2CP02B23	Software Lab-II	4	2	72	20	80
	Complementary Course	MT2B04B23	Fundamentals of Mathematics	4	4	72	20	80
	TOTAL HOURS AND CREDIT			**25**	**20**			
III	Core Course	BC3C05B23	Information Security Fundamentals	4	4	72	20	80
	Core Course	BC3C06B23	Software Engineering	4	4	72	20	80
	Complementary Course	BC3B03B23	Computer Networks	4	4	72	20	80

	Core Course	BC3C07B23	RDBMS	4	3	72	20	80
	Core Course	BC3C08B23	Programming in Java	4	3	72	20	80
	Core Course	BC3CP03B23	Software lab-III	5	2	90	20	80
	TOTAL HOURS AND CREDIT			**25**	**20**			
IV	Core Course	BC4C09B23	Web Programming using PHP	4	4	72	20	80
	Core Course	BC4C10B23	Database Security Fundamentals	4	4	72	20	80
	Core Course	BC4C11B23	Principles of Virtualization	4	4	72	20	80
	Core Course	BC4C12B23	Introduction to Cloud Technology	4	3	72	20	80
	Core Course	BC4C13B23	Ethical Hacking Fundamentals	4	3	72	20	80
	Core Course	BC4CP04B23	Software Lab – IV	5	2	90	20	80
	TOTAL HOURS AND CREDIT			**25**	**20**			
V	Core Course	BC5C14B23	IT, Environment and Human Rights	4	4	72	20	80
	Core Course	BC5C15B23	Cryptography Fundamentals	4	4	72	20	80
	Core Course	BC5C16B23	Computer Forensics and Investigation	4	3	72	20	80
	Core Course	BC5C17B23	Introduction to Python Programming	4	3	72	20	80
	Core Course	BC5D01aB23/ BC5D01bB23	Open Course	4	3	72	20	80
	Core Course	BC5CP05B23	Software Lab – V	5	2	90	20	80
	TOTAL HOURS AND CREDIT			**25**	**19**			
VI	Core Course	BC6C18B23	IT Governance, Risk and Information Security Management	4	4	72	20	80
	Core Course	BC6C19B23	Mobile, Wireless and VOIP Security	4	4	72	20	80
	Core Course	BC6C20B23	Introduction to Windows	4	4	72	20	80

		Azure					
Core Course	BC6C21AB23/ BC6C21BB23/ BC6C21CB23/ BC6C21DB23	Choice Based Core Course	4	4	72	20	80
Core Course	BC6CSB23	Seminar	2	1	36	100	
Core Course	BC6PRB23	Project	7	3	126	20	80
Core Course	BC6CVB23	Viva Voce		1			100
TOTAL HOURS AND CREDIT			**25**	**21**			
TOTAL CREDITS			**120**				

CONSOLIDATED SCHEME - I to VI SEMESTERS PROGRAMME STRUCTURE

BCA (Cloud Technology and Information Security Management)

1. SCHEME OF THE CORE COURSES

Sl. No	Category	Semester	Course Code	Name of the Subject	Credits
1	Core	**Semester 1**	BC1C01B23	Programming in C	3
2	Core		BC1C02B23	Linux Administration	3
3	Core		BC1CP01B23	Software Lab-I	2
				Total Credits	**8**
4	Core	**Semester 2**	BC2C03B23	OOPS with C++	3
5	Core		BC2C04B23	Data structures using C	3
6	Core		BC2CP02B23	Software lab-II	2
				Total Credits	**8**
7	Core	**Semester 3**	BC3C05B23	Information Security Fundamentals	4
8	Core		BC3C06B23	Software Engineering	4
9	Core		BC3C07B23	RDBMS	3
10	Core		BC3C08B23	Programming in Java	3
11	Core		BC3CP03B23	Software Lab III	2
				Total Credits	**16**
12	Core	**Semester 4**	BC4C09B23	Web Programming using PHP	4

13	Core		BC4C10B23	Database Security Fundamentals	4
14	Core		BC4C11B23	Principles of Virtualization	4
15	Core		BC4C12B23	Introduction to Cloud Technology	3
16	Core		BC4C13B23	Ethical Hacking Fundamentals	3
17	Core		BC4CP04B23	Software Lab-IV	2
				Total Credits	**20**
18	Core		BC5C14B23	IT, Environment and Human Rights	4
19	Core		BC5C15B23	Cryptography Fundamentals	4
20	Core	**Semester 5**	BC5C16B23	Computer Forensics and Investigation	3
21	Core		BC5C17B23	Introduction to Python Programming	3
22	Core		BC5CP05B23	Software Lab-V	2
				Total Credits	**16**
23	Core		BC6C18B23	IT Governance, Risk and Information Security Management	4
24	Core		BC6C19B23	Mobile, Wireless and VOIP Security	4
25	Core	**Semester 6**	BC6C20B23	Introduction to Windows Azure	4
26	Core		BC6CSB23	Seminar	1
27	Core		BC6PRB23	Project	3
28	Core		BC6CVB23	Viva voce	1
				Total Credits	**17**

2. SCHEME OF THE OPEN COURSES

(Offered to students of other departments)

Sl No.	Semester	Course Code	Course Title	No.of Contact Hrs./Week	Credits	Total No. of Hrs.
1	V	BC5D01AB23	Informatics and Cyber Ethics	4	3	72
2	V	BC5D01BB23	Security Threats and Trends	4	3	72

3. SCHEME OF THE CHOICE BASED COURSES

Sl No.	Semester	Course Code	Course Title	No.of Contact Hrs./ Week	Credits	Total No. of Hrs.
1	VI	BC6C21AB23	Virtualization and Cloud Security	4	4	72
2	VI	BC6C21BB23	Cloud Web Services	4	4	72
3	VI	BC6C21CB23	Fundamentals of Datacenter	4	4	72
4	VI	BC6C21DB23	Fundamentals of ITIL	4	4	72

4. SCHEME OF THE COMPLEMENTARY CORE COURSES

Sl No.	Semester	Course Code	Course Title	No.of Contact Hrs./ Week	Credits	Total No. of Hrs.
1	I	BC1B01B23	Computer Fundamentals and Organization	4	4	72
2	I	ST1B01B23	Descriptive Statistics	4	4	72
3	II	BC2B02B23	Operating System	4	4	72
4	II	MT2B04B23	Fundamentals of Mathematics	4	4	72
5	III	BC3B03B23	Computer Networks	4	4	72

EXAMINATIONS

The external theory examination of all semesters shall be conducted by the College at the end of each semester. Internal evaluation is to be done by continuous assessment.

Examinations have two parts: Internal or In-Semester Assessment (ISA) & External or End– Semester Assessment (ESA). The ratio between ISA and ESA shall be 1:4. Both internal and external marks are to be rounded to the next integer.

MARKS DISTRIBUTION FOR ESA AND ISA

Marks distribution for ESA and ISA and the components for evaluation with their marks are shown below:

For all courses without practical

a) End–Semester Assessment (ESA):　　　80 marks

b) In-Semester Assessment (ISA):　　　20 marks

ISA - Theory	Marks
Attendance	5
Assignment* /Seminar/Viva	5
Test papers (2 x 5)	10
Total	20

Attendance:

Percentage of Attendance	Marks
90% or above	5
Between 85 and below 90	4
Between 80 and below 85	3
Above 75 and below 80	2
75 %	1
< 75	0

*Assignment

1. For core papers (III & IV Semester), the student must undertake a Project/ Field work/ Industrial Visit/ Internship and the report of the same should be submitted for evaluation. The marks awarded to this can be considered for assignment of any one core paper.

2. *Assignment(project/field work/ Industrial Visit) for Semester I & II- to be given by language teachers, report of which has to be submitted and for those programmes which do not have additional language the students must undertake the assignment (project/field work/ Industrial Visit) for any one core paper.

For All Practical Papers

Internal assessment components	Marks
Attendance	5
Test paper	10
Record*	3
Lab Involvement	2
Total	20

*Marks awarded for Record should be related to number of experiments recorded

For Project

Components of External Evaluation of Project	Marks
Demonstration and Presentation	40
Project Viva	20
Project Report	20
Total	**80**

* Projects which are preferably socially relevant/ industry oriented/ research oriented are to be undertaken by the students. Bonafide report of the project work conducted shall be submitted at the time of examination.

Components of Internal Evaluation of Project	Marks
Attendance	5
Review 1	5
Review 2	5
Demonstration and Viva	5
Total	**20**

For Seminar

Each student can choose a latest topic of current day interest in the areas of Computer Science/Information Technology and present a seminar presentation using appropriate presentation. media.

Components of Internal Evaluation of Seminar	Marks
Demonstration and Presentation	40
Knowledge in the topic	20
Novelty of the topic	10
Seminar Report	10
Promptness	20
Total	**100**

For Viva Voce

There will only be External Evaluation for Viva Voce – 100 marks

Pattern of Question Paper:

A question paper shall be a judicious mix of short answer type, short essay type/ problem solving type and long essay type questions.

For each course the End-semester Assessment is of 3 hours duration. The question paper has 3 parts. Part A contains 12 objective type questions of which 10 are to be answered. Part B contains 9 short essay questions of which 6 are to be answered. Part C has 4 long essay questions of which 2 are to be answered.

Part	No. of Questions	No. of questions to be answered	Marks (for courses without practical)
A(Short Answer type)	12	10	10 x 2 = 20
B(Short Essay)	9	6	6 x 5 = 30
C (Long Essay)	4	2	2 x 15 =30

GRADE

A 10 -point scale based on the total percentage of marks (ISA + ESA) for all courses (theory, practical, project)

Percentage of marks	Grade		Grade point
Equal to 95 and above	S	Outstanding	10
Equal to 85 and < 95	A^+	Excellent	9
Equal to 75 and < 85	A	Very good	8
Equal to 65 and < 75	B^+	Good	7
Equal to 55 and < 65	B	Above average	6
Equal to 45 and < 55	C	Satisfactory	5
Equal to 35 and < 45	D	Pass	4
Below 35	F	Failure	0
	Ab	Absent	0

PASS CRITERIA:

● A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 35% for a pass in a course

● For a pass in a programme, a separate minimum of Grade D is required for all the individual courses

● If a candidate secures F Grade for any one of the courses in a semester/programme, only F grade will be awarded for that semester/programme until he/she improves this to D

Grade or above within the permitted period

- Students who complete the programme with D grade will have one betterment chance within 12 months, immediately after the publication of the result of the whole programme

CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a course is calculated:

$$CP = C \times GP$$

C = Credit; GP = Grade point

Semester Credit Point Average (SCPA) of a semester:

$$SCPA = TCP/TC$$

TCP = Total Credit Point of that semester

TC = Total Credit of that semester

Cumulative Credit Point Average (CCPA) is calculated:

$$CCPA = TCP/TC$$

CPA	Grade	
Equal to 9.5 and above	S	Outstanding
Equal to 8.5 and < 9.5	A_+	Excellent
Equal to 7.5 and < 8.5	A	Very good
Equal to 6.5 and < 7.5	B_+	Good
Equal to 5.5 and < 6.5	B	Above average
Equal to 4.5 and < 5.5	C	Satisfactory
Equal to 4 and < 4.5	D	Pass
Below 4	F	Failure

- For reappearance/improvement for other semesters, appear along with the next batch.

- Notionally registered candidates can also apply for the said supplementary examinations.

- A student who registers his name for the external exam for a sem will be eligible for promotion to the next semester.

- A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

- A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

- There shall be no improvement for internal evaluation.

- All rules and regulations are subject to change as and when modified by Mahatma Gandhi University Kottayam, to which St. Teresa's College (Autonomous) Ernakulam is affiliated.

SYLLABI

FOR

CORE COURSES

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SEMESTER: 1

CORE COURSE

</div>

BC1C01B23 - PROGRAMMING IN C

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

C is an important procedural language and was developed initially to write the UNIX operating system. C is popular because it is easy to learn, produces efficient programs, can handle low-level activities, and can be compiled on a variety of platforms. This is an introductory course and covers the key features of the C language and its usage. The first two modules help in thoroughly understanding the basics concepts, syntax and constructs of the C language. The latter modules focus on more complex concepts of the C language. This course will briefly touch upon some of the standard library functions and file handling in C. For learners, who are new to programming, this course can be considered as the starting point before taking up any other programming-oriented courses.

This course is based on industrial programming experience. This course enhances the logical and programming capabilities of students.

Course Outcome:

CO1: Discuss computer-based problem-solving methods and explain the programming environment. (Understand level)

CO2: Create programs using basic, advanced and file concepts in C. (Create level)

CO3: Test and debug the programs. (Create level)

CO4: Develop software applications using dynamic data structures. (Create level)

Content:

Module I: (10 hrs)

Overview of Programming: Introduction to programming, Classification of computer languages, Language translators (Assembler, Compiler, Interpreter), Linker, Characteristics of a good programming language, Algorithm, Flowchart, Pseudocode, Control structures (sequence, selection, Iteration).

Module II: (18 hrs)

Fundamentals of C programming: Overview of C, Types of Tokens, C Keywords, Identifiers, Constants & Variables, Data Types, Operators & Expressions, Type modifiers, Type conversion.

Input and Output in C – Formatted functions, unformatted functions, commonly used library functions.

Decision Statements- If, if-else, nested if-else, if-else-if ladder, break, continue, goto, exit (), switch.

Loop control- for loops, nested for loops, while loops, do while loop.

Module III: (18 hrs)

Advanced programming techniques: Arrays- array terminology, characteristics of an array, initialization, one dimensional array, two-dimensional array and its operations. Strings and standard functions. Functions- Fundamentals, Types of functions, call by value and reference. Recursion - Types of recursion, Rules for recursive function, Advantages and disadvantages of recursion. Storage classes.

Module IV: (16 hrs)

Dynamic data structures in C: Structure and union- Features of structures, Declaration and initialization of structures, array of structures, Union, Dynamic memory allocation. Pointers- Features of Pointer, Pointer and address, Pointer declaration, Arithmetic operations with pointers, pointer and arrays, pointers and two-dimensional arrays.

Module V: (10 hrs)

Additional features: File Handling – The file pointer, file accessing functions, fopen, fclose, puc, getc, fprintf, C Preprocessor- #define, #include, #undef, Conditional compilation directives.

Text Books:

- Let us C by Yashwant Kanetka, 6th Edition, PBP Publication
- Programming in ANSI C by Balaguruswamy, Seventh Edition, Tata McGraw Hill

Reference Book:

- The C programming Language by Richie and Kenninghan, 2004, BPB Publication

- Computer Fundamentals by P K Sinha & Priti Sinha, Fourth Edition, BPB Publications

MODEL QUESTION PAPER
BCA DEGREE (C.B.C.S.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - CORE COURSE FOR
BCA (CLOUD TECHNOGY AND INFORMATION SECURITY MANAGEMENT)
BC1C01B23: PROGRAMMING IN C

Time : 3 hours   Maximum marks: 80

Part A

(Answer any ten questions. Each question carries 2 marks)

Qn.No.	Questions	CO	Level of Question
1.	Define Algorithm.	1	R
2.	Differentiate 'Compiler' and 'Interpreter'.	1	U
3.	Discuss about the character set in C.	2	U
4.	Describe the data types in 'C' programming.	2	U
5.	Explain the syntax of the switch statement.	2	U
6.	Discuss about Dynamic Data structures in C.	4	R
7.	Write a program to print 'Hello C Programming'.	2	Ap
8.	Differentiate local and global variables in 'C' programming.	1	Ap
9.	Define structures in 'C' programming.	3	R
10.	What do you mean by 'Call by value'?	2	U
11.	Discuss about the preprocessors in C.	1	U
12.	Define File pointer.	2	R

(10 x 2 = 20 marks)

Part B

(Answer any six questions. Each question carries 5 marks)

Qn.No.	Questions	CO	Level of Question
13.	Write an algorithm and draw a flowchart to simulate a simple calculator.	2	C
14.	Write a program to implement malloc() and calloc() functions.	4	Ap
15.	Explain the operators in 'C' programming.	2	U
16.	Identify the differences between 'while' and 'do while' loop with example?	3	U
17.	Write a 'C' function to find the largest number among three numbers.	2	Ap
18.	Write down a program to use structure within union, and display the contents of structure elements.	3	C
19.	Illustrate the difference between call by value and call by reference methods with suitable examples.	2	Ap
20.	Write a program to print the details of 50 students using structures in 'C' programming.	3	C
21.	Write a 'C' program to read the content of file using 'fgets	2	C

(6 x 5 = 30 marks)

Part C

(Answer any two questions. Each question carries 15 marks.)

Qn.No.	Questions	CO	Level of Question
22.	Write a program to find the transpose of a given square matrix.	2	Ap
23.	Write down the algorithm and program to print 'Fibonacci' series using recursion.	3	Ap

24.	What is Dynamic Memory Allocation? Explain DMA with examples.	2	U
25.	Explain the string and mathematical functions in detail with examples.	3	U

SEMESTER: 1
CORE COURSE

BC1C02B23 - LINUX ADMINISTRATION

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The Course provides an overview of the Linux Operating System, and helps the learners get a better understanding of the linux system. The course explores the basics of Unix, the underlying management of the Linux operating system, network configuration and its administration. This course also focuses on Linux system administration which covers the setting up, configuring, and managing a computer system in a Linux environment. System administration involves creating a user account, taking reports, performing backup, updating configuration files, documentation, and performing recovery actions.

This course enhances the logical, programming and technical capabilities of students. It also helps the learner to become a Linux Administrator

Course Outcomes:

CO1: Explain the history and features of UNIX OS, the common Unix Commands, management of user accounts & Collaborate Process Management in UNIX. (Understand)

CO2: Associate Unix File management, file commands, file and directory permissions. (Understand)

CO3: Construct Text Processing using VI Editor. (Apply)

CO4: Illustrate the installation and administration of LINUX OS. (Apply)

CO5: Practice basic networking and naming services in Linux. (Apply)

Content:

Module I: (10 hrs)

History of UNIX, UNIX Components/Architecture, Common Linux/ Unix Features, advantage of Linux, linux distribution, basic commands,combining commands, internal and external commands, The root login - super user: sudo command, /etc/passwd and /etc/shadow files

UNIX Process Management: The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Managing Process, Background Processing.

Module II: (15 hrs)

UNIX file system: Unix File basics Types of files, structure of a regular files, Directory structure of a UNIX file system,Navigating the File Systems,Creating and Managing File Systems, File System Backup, File Permission and Access,blocks, Inodes,Superblock the PATH variable, Allocation of disk: – Directories - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open – Read - Write - Lseek – Close - File creation - Creation of special files - Changing directory and root - changing owner and mode – stat and fstat - pipes - Dup

Input and Output Redirection: Input Redirection, Output Redirection, Error Redirection,Filter.

Module III: (15 hrs)

Vi Editor: Vi editor in a glance and introduction to text processing.

Shell programming: Introduction – Need for Scripts – Creating and Calling the Script – The Shebang – Different ways of running a script - Using variables in Script – Reading Input – Integer Variables – Arithmetic Expressions – Read-only variables – Exporting variables – Arrays - Control Statements : If, Then, Else, While and Until, Classic For, Break and Continue, Case – Handling Script Parameters : Shift, Getopts – Shell Functions – Handling Conditional expression patterns and Regular expressions in scripts

Module IV: (16 hrs)

 Installing Linux, Configuring Disk Devices, Kickstart Installation, Linux Boot Loaders, Linux Kernel Management, Managing User Accounts, Managing Software using RPM, Connecting to Network, Linux Network Services, Setting up a Printer , Accessing Remote system, Transferring files, and Internet configuration.

Module V: (16 hrs)

Linux Basic networking and naming service: Introduction to Networking, Networking, Internet Network Services, Dynamic DNS, Electronic Messaging, Apache , NIS and Network File Sharing: NIS, Network File Sharing, SAMBA. Security: Defining System Security Policies, System Authentication Services and Security, Securing Services, Securing Data and Communication.

Text Books

● Sumitabha Das., Unix Concepts and Applications., 4th Edition., Tata McGraw Hill, July 2017.

● Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming- Cengage Learning – India Edition. 2009

● Red hat Linux Administration By Michael Turner and Steve Shah-McGraw-Hill Companies, Inc Publisher, 2010

Reference Books

● Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.

● Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2nd Edition , Wiley,2014

● RHCSA/RHCE Red Hat Linux Certification Study Guide (Exams EX200 & EX300), 6th Edition (Certification Press) [Paperback] Michael Jang, McGraw-Hill Osborne Media; 6th edition (June 17, 2011)

MODEL QUESTION PAPER
BCA DEGREE (C.B.C.S.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - CORE COURSE FOR
BCA(CLOUD TECHNOGY AND INFORMATION SECURITY MANAGEMENT)
BC1C02B23: LINUX ADMINISTRATION

Time: 3 hours   Maximum marks: 80

Part A

(Answer any ten questions. Each question carries 2 marks)

Qn.No.	Questions	CO	Level of questions
1.	Describe the graphical mode used on most Linux based desktops.	**1**	**U**

Qn.No.	Questions	CO	Level of questions
2.	Define a. X Windows system b. GNOME	1	R
3.	Compare 'mv' and 'rm' UNIX commands.	2	U
4.	Indicate the purpose of 'chmod' command.	2	U
5.	Define break and continue statements.	3	R
6.	Describe script parameter.	3	U
7.	Define the importance of mounting?	4	R
8.	Define the functions of dump and restore?	4	R
9.	Define the functions of cpio?	4	R
10.	Define DNS?	5	R
11.	Explain Squid proxy services.	5	U
12.	Explain File system security.	5	U

(10 x 2 = 20 marks)

Part B

(Answer any six questions. Each question carries 5 marks)

Qn.No.	Questions	CO	Level of questions
13.	Explain the directory structure of UNIX file system.	2	U
14.	Explain various control statements with example.	3	U
15.	Explain securing of data and communication in detail.	4	U
16.	Explain in detail the Kickstart installation steps.	5	U

17.	Explain the usage and interpretation of any 5 special characters.	**1**	**U**
18.	Differentiate between hard link and soft link	**2**	**U**
19.	Summarize on Unix directory structure.	**2**	**U**
20.	Define shebang in shell script	**3**	**R**
21.	Differentiate between while and until loop.	**3**	**U**

(6 x 5 = 30 marks)

Part C

(Answer any two questions. Each question carries 15 marks.)

Qn.No.	Questions	CO	Level of questions
22.	Define the Backup methods in Linux with the help of commands	**4**	**R**
23.	What are the basic functions of a kernel?	**4**	**R**
24.	Explain LDAP.	**5**	**U**
25.	Explain SAMBA.	**5**	**U**

(2 x 15 = 30 marks)

CO: Course Outcomes
Level: R – Remember, U – Understand, Ap- Apply, An- Analyze, E- Evaluate, C- Create

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SEMESTER: 1

CORE COURSE

</div>

BC1CP01B23 - Software Lab I (Core)

Credits: 2

Hours per week: 4   **Total Lecture Hours:72**

Course Outcomes:

CO1: Develop diverse programs for a single problem using basic and advanced programming techniques in C and Linux. (Create)

CO2: Validate programs by testing and debugging processes. (Create)

CO3: Illustrate shell & UNIX Commands. (Apply)

CO4: Practice the installation and administration of LINUX OS. (Apply)

I. Linux Administration (2 hrs. per week)

1. Execute basic commands of UNIX.

2. Basics of functionality and modes of VI Editor.

3. Write a shell script to ask your name, program name and enrollment number and print it on the screen.

4. Write a shell script to find the sum, the average and the product of the four integers entered

5. Write a shell program to exchange the values of two variables.

6. Find the lines containing a number in a file

7. Write a shell script to display the digits which are in odd position in a given 5 digit number

8. Write a shell script to find the largest among the 3 given numbers

9. Write a shell script that displays "man","bear", "pig", "dog", "cat", and "sheep" on the screen with each appearing on a separate line. Try to do this in as few lines as possible.

10.   Write a shell script that prompts the user for a name of a file or directory and reports if it is a regular file, a directory, or another type of file. Also perform an ls command against the file or directory with the long listing option.

11.   Linux Installation using Virtual box

12.   Kickstart installation

13.   File system implementation

14. Foreground & background process management

15. Executing basic networking commands

16. Setting up of a network printer

17. Package management using rpm package manager

II. Programming in C (2 hrs. per week)

1. Programs to print different series

2. Programs using Arrays

3. Programs using Functions

4. Programs using String

5. Programs using Structures

6. Programs using Union

7. Programs using Pointers

8. Programs using Files

Scheme of Evaluation for software lab II external is as follows:

(There will be two questions; the first from C and second from Linux)

Division of Marks (Practical - 3 hours External)

First program - questions from LINUX   **- 25 marks**

   1. Logic   – 10 marks

   2.Successful compilation – 8 marks

   3. Result   – 7 marks

Second program – questions from C   **- 35 marks**

   1. Logic   – 20 marks

   2.Successful compilation –10 marks

   3. Result   – 5 marks

Viva Voce   **- 10 marks**

Lab Record   **- 10 marks**

(LINUX -Minimum of 10 Programs

 C   -Minimum: of 15 Programs)

Total Marks   **- 80 marks**

SEMESTER: 2
CORE COURSE

BC2C03B23 - OOPS WITH C++
Credits: 3
Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

C++ is an object oriented, middle-level programming language. It runs on a variety of operating systems. C++ is an extension of C with a major addition of the class construct feature. C++ is a versatile language for handling very large programs; it is suitable for virtually any programming task including development of editors, compilers, databases, communication systems and any complex real life applications systems. This course focuses on providing an introduction to object oriented programming concepts, C++ syntax, classes, functions, operators, errors and exceptions, file manipulation etc

The course aims at enabling learners with logical and programming skills which make them capable of developing technical solutions to problems.

Course Outcomes:

CO1: Describe the basic concepts of object oriented programming. (Understand)

CO2: Apply the concepts of constructors, operator overloading, inheritance and polymorphism   with C++ programming**. (Apply)**

CO3: Illustrate file manipulation using C++. (Apply)

CO4: Develop generic programming with templates in C++. (Apply)

Content:

Module I: (12 hrs)

Introduction: Evolution of programming methodologies, Procedure oriented versus Object Oriented Programming, Basic concepts of OOP, Merits and Demerits of OOP. Data Types and Keywords in C++, operators and expressions in C++.

Input and Output: Comparison of stido.h and iostream.h, cin and cout.

Decision and loop: Conditional statement - if-else statement, nested if-else statement, switch, break, continue, and goto statements, Looping statements- for loop, while loop, Do-while loop.

Arrays, String and Structures : Fundamentals of Arrays - creating and accessing arrays, fundamentals of Strings - string manipulation. Basics of Structures - declaring, defining and accessing structure, Unions, Difference between Structures and Unions, Enumerated data types. storage classes- automatic, external, static, register.

Module II: (15 hrs)

Class: Class specification in C++, defining data members and member functions, access specifiers - private, public, protected, array as class member data, array of objects, objects as function arguments, returning objects from the function, difference between class and structure.

Functions in C++ : Function definition, function declaration, built-in functions, user defined functions, passing parameter-actual and formal, calling the function - call by value, call by reference, function overloading - different types of arguments - different number of arguments, inline function, default argument.

Constructor and Destructor: Constructors - constructor with argument, constructor without arguments, constructor with default arguments, Dynamic constructor, copy constructor, constructor overloading, destructors.

Module III: (15 hrs)

Operator overloading: Operator overloading, rules for overloading operator, overloading unary operator, overloading binary operator.

Data conversion: conversion between basic types, conversion between objects & basic types, conversion between objects of different classes.

Inheritance: Base Class & derived class, defining derived classes, protected access specifier, public inheritance and private inheritance-member accessibility, constructors and destructors in derived classes, Level of inheritance-single inheritance, multiple inheritance, multi-level inheritance, hierarchical inheritance, hybrid inheritance.

Module IV: (15 hrs)

Pointer: Pointer declaration and access, pointer and arrays, array of pointers, pointer and functions,

pointer to string, memory management - new and delete, pointer to object - referencing members using pointers, this pointer.

Virtual function: Definition and access, Run time polymorphism - late binding, pure virtual function, abstract class, virtual base class

 Friend functions and static function: Purpose, defining friend functions, friend classes, static function, accessing static function.

Module V: (15 hrs)

Templates and Exception Handling: Introduction to templates, class templates, function templates, Member function templates, Template arguments, Exception handling.

Console IO Operator : C++ stream and C++ stream classes, unformatted I/O operators, formatted I/O operators - manipulators - user defined manipulators.

Files: Class for file stream operators, opening and closing a file, writing an object to disk, reading an object from disk, I/O with multiple objects, file pointer -, tellg() and seekg() function. Command line arguments.

Text Books

- E. Balaguruswamy: Object Oriented Programming with C++, Tata McGraw Hill. Publications
- Let us C++ by Yeshwanth Kanetkar
- Stroustrup: The C++ Programming Language, Pearson Edition, 3rd Edition
- Lafore Robert: Object Oriented Programming in Turbo C++, Galgotia Publications

Reference Books

- Lippman: C++ Primer, 3/e Pearson Education
- C++ complete reference by Herbert Schildt, Tata McGraw Hill Publications

SEMESTER: 2
CORE COURSE

BC2C04B23 - DATA STRUCTURES USING C
Credits: 3
Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

Data is needed by the computer to perform different operations. These operations can be logical or arithmetic. Data can be numbers, alphabets, symbols, etc. When the quantity of data increases, then storing them becomes the biggest concern for every system. A program or an operation will work efficiently if the data is easily accessible and stored safely. This is where you use data structures. Data structures help in storing data in a well-organized manner in the memory. This course covers the basics of data structure and dynamic memory allocation. It deals with operations like sorting, searching, retrieving, etc. Operations on data structures like stacks, queues, linked lists, trees, arrays, and graphs are covered here. This course helps to understand different data structures and how to use them effectively for solving problems.

This course is based on industrial programming experience. This course enhances the logical and programming capabilities of students.

Course Outcomes:

CO1: Understand the basic data structures and their classifications, memory allocation, and recursive functions. (Understand level)

CO2: Illustrate different searching and sorting techniques. (Apply level)

CO3: Differentiate stack, queue, linked lists, tree and graph data structures, its types, applications and operations performed on it. (Understand level)

CO4: Write programs in C to implement basic data structures and to perform operations on it. (Apply level)

Content:

Module I: (10 hrs)

Introduction to Data structures : Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm, Examples. String processing. Dynamic memory allocation- Static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Pointers- Declaring and initializing pointers, Accessing a variable through its pointer. Recursion in C- Advantages and Disadvantages, Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.

Module II: (16 hrs)

Searching and sorting: Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. **Sort:** General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort.

Module III: (16 hrs)

Stack and Queue: Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks.

Queue - Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue, Operations on Queues.

Module IV: (15 hrs)

Linked List: Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Module V: (15 hrs)

Tree, Graphs and their Applications: Tree: Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree, Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder,

Inorder and postorder.

Graphs: Graphs, Application of Graphs, Depth First search, Breadth First search.

Text Books:

- Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001
- Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill
- Robert Kruse Data Structures and program designing using 'C'
- Trembley and Sorenson Data Structures

Reference Books:

- Bandyopadhyay, Data Structures Using C Pearson Education, 1999
- Tenenbaum, Data Structures Using C. Pearson Education, 200
- Kamthane: Introduction to Data Structures in C. Pearson Education 2005.
- Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006
- Langsam, AusensteinMaoshe& M.Tanenbaum Aaron   Data Structures using C and C++ Pearson Education

SEMESTER: 2

CORE COURSE

BC2CP02B23 - SOFTWARE LAB-II

Credits: 2

Hours per week:4   **Total lecture Hours: 72**

Course Outcomes:

CO1: Design programs in C++ which deal with file manipulation. (Create)

CO2: Develop programs in C++ to solve problems using object oriented concepts. (Create)

CO3: Develop programs in C to implement basic data structures and its operations. (Create)

   I. OOPS WITH C++ - LAB (2 hrs per week)

1. Basic C++ programs using operators, control statements and loops.

2. Programs to implement Arrays, Strings and Structures.

3. Program to implement class.

4. Program to implement constructor and destructor

5. Program to implement inline functions.

6. Program to implement function overloading.

7. Program to implement operator overloading.

8. Program to implement all types of inheritance.

9. Program to implement virtual function and runtime polymorphism.

10. Program to implement friend functions and static functions.

11. Program to implement templates and exception handling.

12. Program to implement files.

   II. DATA STRUCTURES USING C – LAB (2 hrs per week)

1. Program to implement Arrays

2. Program to implement Recursive Functions

3. Program to implement Pointers

4. Program to implement Searching Techniques

5. Program to implement Sorting Techniques

6. Program to implement Stack

7. Program to implement Queue

8. Program to implement Linked List

9. Program to implement Trees

10. Program to implement Graph

Scheme of Evaluation for software lab III external is as follows:

(There will be two questions, the first program from OOPS With C++ and second program from Data Structures using C)

Division of Marks (Practical - 3 hours External)

First Program- questions from OOPS with C++ Lab- 25 marks

1. Logic   – 10 marks

2. Successful compilation – 8 marks

3. Result   – 7 marks

Second questions from Data Structures using C - 35 marks

1. Logic   – 20 marks

2. Successful compilation –10 marks

3. Result   – 5 marks

Viva Voce **- 10 marks**

Lab Record   **- 10 marks**

(OOPS with C++ -Minimum of 10 Programs

Data Structures using C – Minimum of 15 Programs)

Total Marks   - 80 mark

SEMESTER: 3
CORE COURSE

BC3C05B23 - INFORMATION SECURITY FUNDAMENTALS

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context

This course begins with an overview of information security and its evolution. This first section introduces the core goals of information security, the CIA triad. Some common information security terms and processes used in the information security industry are defined and outlined. Types of controls and their function are categorized so that the learner can comprehend the design of a defense-in-depth system. The unit concludes with a justification of why humans are known as the weakest link in information security and describes how security awareness training can serve to mitigate this risk.

This course builds a strong technical knowledge in the field of Information Security.

Course Outcomes:

CO1: Describe the basic concepts, principles and business needs of information security. (Understand)

CO2: Differentiate various cyber attacks. (Understand)

CO3: Discuss the risk management Process. (Understand)

CO4: Identify control measures for network infrastructure security. (Understand)

CO5: Explain information asset classification. (Understand)

Content

Module I:

(14 hrs)

Know the Basics about the Information Security: Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; implement IT Security, The system Development Life cycle, Security professional in the organization.

Module II: (14 hrs)

Gain Skills on the Need of Information Security: Business Needs-Protecting the functionality, Enabling the safe operations, Protecting the data, safe guarding the technology assets; Threats- compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotage and vandalism; Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering

Module III: (15 hrs)

Identify how the Risk Management Performs: Definition of risk management, risk identification, and risk control, Identifying and Accessing Risk, Assessing risk based on probability of occurrence and likely impact, the fundamental aspects of documenting risk via the process of risk assessment, the various risk mitigation strategy options, the categories that can be used to classify controls.

Module IV: (15 hrs)

Know the detailed descriptions on Network Infrastructure Security and Control: Understanding Infrastructure Security- Device Based Security, Media-Based Security, Monitoring and Diagnosing; Monitoring Network- Firewall, Intrusion Detection System, Intrusion Prevention system; OS and Network Hardening, Application Hardening; Physical and Network Security- Policies, Standards and Guidelines.

Module V: (14 hrs)

Information Asset Classification: Classification of Information, Information Assets – Owner, Custodian, User, Information Classification in terms of Secret, Confidential, Private and Public, Declassification. Retention and Disposal of Information Assets. Provide Authorization for Access – Owner, Custodian and User

Text Books:

- Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)
- Information Security Risk Analysis - Thomas R. Peltier, Third Edition,

Pub: Auerbach, 2012

● Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008

● Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Reference Books:

● Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5 edition (2015)

● Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30 June 2017)

SEMESTER: 3
CORE COURSE

BC3C06B23 - SOFTWARE ENGINEERING

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

Software can be defined as 'computer instructions or data'. The term 'Software Engineering' is applied to the study and application of engineering for the purpose of design, development and maintenance of software. In general, it is the set of rules and procedures to be followed while developing computer software. Software Engineering is all about the right practices and approach towards computer programming; hence everyone is of the opinion that it must be considered as an engineering segment rather than art or craft. This course deals with the different software development lifecycle models, and software testing. It also deals with software project management concepts like different models, Planning, scheduling, etc.

This course improves the planning, designing and technical skills of the learner.

Course Outcomes:

CO1: Describe various life cycle models of the software development process. (Understand level)

CO2: Identify requirements of software development projects**.** (Understand level)

CO3: Discuss the principles and techniques involved in software design. (Understand level)

CO4: Distinguish types of software testing. (Understand level)

CO5: Compare the metrics and measurements of software project management. (Understand level)

Content:

MODULE I: (10 hrs)

Software Product And Process: Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – System Engineering – Computer Based System – Business

Process Engineering, Overview – Product Engineering Overview.

MODULE II: (16 hrs)

Software Requirements: Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary.

MODULE III: (16 hrs)

Analysis, Design Concepts And Principles: Systems Engineering - Analysis Concepts - Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

MODULE IV: (15 hrs)

Testing: Taxonomy Of Software Testing – Types Of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based On Data Flow Mechanisms – Regression Testing – Module Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques

MODULE V: (15 hrs)

Software Project Management: Measures And Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools

Text Books:

- Ian Sommerville, "Software engineering", Seventh Edition, Pearson Education Asia, 2007

Reference Books:

- Roger S. Pressman, "Software Engineering – A practitioner's Approach", Sixth Edition, McGraw-Hill International Edition, 2005

SEMESTER: 3
CORE COURSE

BC3C07B23 - RDBMS
Credits: 3
Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

Databases play an integral part in commercial domains. Users will be able to store, model and retrieve data. Development of secure databases is an important task when it comes to computing. Database Management Systems (DBMS) provide the systems, tools and interfaces by which the organization can manage their information and use it to assist in the effective running of the organization. This course explores database architecture, database management system and the use of databases in an organizational context. Database design techniques are investigated and successful learners will be able to apply theoretical understanding to design, create and document a database system.

This course aims to equip learners with planning, designing and management skills. Also enable them with technical skills so as to develop technical solutions encompassing planning, designing and management.

Course Outcomes:

CO1: Describe the concept of relational database management system. (Understand)

CO2: Illustrate use of SQL queries to manage a relational database. (Apply)

CO3: Explain how various normal forms are achieved in database design. (Understand)

CO4: Discuss the concepts of transaction processing. (Understand)

Content:

MODULE I: (15 hrs)

Introduction: Purpose of Database System -– Database System Architecture – Views of data – Database Languages — Database users and Administrator – Data Models – Entity- Relationship model (E-R model) – E-R Diagrams -- Introduction to Relational databases.

MODULE II: (10 hrs)

The relational Model: The Database catalog - Types – Oracle data types Keys – Integrity constraints– Data Constraints, Column level & table Level Constraints. Relational Algebra Operations.

MODULE III: (16 hrs)

SQL fundamentals: Table creation, constraints on tables, Integrity constraints, Inserting values, Select Command - logical operator, ordering, range searching, pattern matching. Groping and aggregate functions. Nested queries, Joining Multiple Tables, Union, intersect & Minus Clause, Data manipulation - Update command, Delete command. Alter command - add/alter columns and constraints, Drop command.

Creating and managing views - Updation, Selection, Destroying view, Creating and managing users. Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases

MODULE IV: (15 hrs)

Database Design: Decomposition - Lossy and lossless – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form- Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

MODULE V: (16 hrs)

Transaction Concepts: Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock-Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.

Text Books

- Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Fifth Edition, Tata McGraw Hill, 2006
- Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson/Addision Wesley, 2007

Reference Books

- Avison D and Fitzgerald G – Information Systems Development: Methodologies,

Techniques and Tools, McGraw Hill Higher Publishing Company, 2006

- Connolly T and Begg C – Database Systems: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2004

- Howe D – Data Analysis for Database Design, Butterworth-Heinemann Ltd, 2001

- Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2003.

- Chao L – Database Development and Management, CRC Press, 2006

- Kroenke D – Database Concepts, 2nd Edition, Prentice Hall, 2004

- Ritchie C – Relational Database Principles, Thomson Learning, 2002

SEMESTER: 3

CORE COURSE

BC3C08B23 - PROGRAMMING IN JAVA

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

Object oriented programming is the most proven technique for developing reliable programs. It helps in increased productivity, reusability of code, decrease in the development time, and reduces cost of production to an extent.Java is a purely object oriented language. Systems/applications created using java programming language reduces the need for developing and maintaining complex and space consuming applications. Java has a lot of advantages of being simple, robust, platform independent, etc. This course covers basic to advanced concepts related to Java Programming including Applet programming, AWT Packages and JDBC. This course focuses on the concepts of object oriented programming language and the different constructs for creating applications in java.

This course equips the learners with logical and programming skills.

Course Outcomes:

CO1: Discuss the basic concepts of Java programming.(Understand)

CO2: Illustrate basic Java programs using Object oriented concepts. (Apply)

CO3: Develop user-interface applications using advanced java programming concepts.(Apply)

CO4: Examine JDBC Connectivity in java.(Apply)

Content:

Module I: (16 hrs)

Introduction: History, Overview of Java, Object Oriented Programming, A simple Programme, Two control statements - if statement, for loop, using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words

Data types: Integers, Floating point, characters, Boolean, A closer look at Literals,

Variables, Type conversion and casting, Automatic type promotion in Expressions Arrays.

Operators: Arithmetic operators, The Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence.

Control Statements: Selection Statements - if, Switch **Iteration Statements**: While, Do-while, for Nested loops, Jump statements

Module II: (16 hrs)

Classes: Class Fundamentals, Declaring objects, Assigning object reference variables, Methods, constructors, "this" keyword, finalize ( ) method A stack class, Over loading methods, using objects as parameters, Argument passing, Returning objects, Recursion, Access control, Introducing final, understanding static, Introducing Nested and Inner classes, Using command line arguments.

Inheritance: Inheritance basics, Using super, method overriding, Dynamic method Dispatch, using abstract classes, using final with Inheritance.

Module III: (15 hrs)

Packages: Definition, Access protection importing packages, Interfaces: Definition implementing interfaces.

Exception Handling: Fundamental, Exception types, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's Built - in exception, using Exceptions.

Module IV: (15 hrs)

Multithreaded Programming: The Java thread model, The main thread, Creating a thread, Creating multiple thread, Creating a thread, Creating multiple threads, Using isalive() and Join(), Thread - Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi threading. I/O basics, Reading control input, writing control output, Reading and Writing files, Applet Fundamentals, the AWT package,AWT Event handling concepts.

Module V: (10 hrs)

JAVA Database Connectivity (JDBC): JDBC architecture, JDBC Drivers, the JDBC API: loading a driver, connecting to a database, Creating and executing JDBC statements,

Handling SQL exceptions, Accessing result sets: Types of result sets, Methods of result set interface. An example JDBC application to query a database

Text Books:

- The complete reference Java –2: V Edition By Herbert Schildt Pub. TMH.
- SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education.

SEMESTER: 3

CORE COURSE

BC3CP03B23 - SOFTWARE LAB-III

Credits: 2

Hours per week: 5   **Total lecture Hours: 90**

Course Outcomes:

CO1: Design a database with multiple tables and relationships between them. (Create)

CO2: Create and manipulate a relational database with SQL. (Create)

CO3: Develop advanced java programs to solve problems using Object oriented concept sand   AWT Package.s (Create)

CO4: Build java programs using the connectivity between frontend and backend with various JDBC drivers. (Create)

RDBMS - LAB (2hrs per week)

Content:

1. SQL Commands

     a. Data Definition Language commands

     b. Data Manipulation Language commands

     c. Data Control Language commands

     d. Transaction Control Language commands

2. Table creation and data insertion

3. Select Statements with all clauses/options

4. Nested Queries

5. Join Queries

6. Alter tables - add/alter columns and constraints.

7. Views

PROGRAMMING in JAVA – LAB (3hrs per week)

Content:

8. Program implementing basic operators.

9. Program to implement control statements and loops.

10. Program to implement methods, recursion, overloading.

11. Program to implement inheritance and overriding.

12. Program using Abstract classes.

13. Program to implement exception handling

14. Program to implement threads.

15. Program to implement interfaces.

16. Program to implement Applet and AWT package.

17. Program to implement JDBC.

Scheme of Evaluation for software lab III external is as follows:

(There will be two questions, the first program from RDBMS and second program from Programming in Java)

Division of Marks (Practical - 3 hours External)

First Program- questions from RDBMS Lab   - 25 marks

1. Logic   – 10 marks

2. Successful compilation – 8 marks

3. Result   – 7 marks

Second questions from Programming using Java - 35 marks

1. Logic   – 20 marks

2. Successful compilation –10 marks

3. Result   – 5 marks

Viva Voce **- 10 marks**

Lab Record   **- 10 marks**

(RDBMS Lab -Minimum of 10 Programs

Programming using Java – Minimum of 15

Programs)

Total Marks   **- 80 marks**

SEMESTER: 4
CORE COURSE

BC4C09B23 - WEB PROGRAMMING USING PHP

Credits: 04

Hour per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The course provides the basic structure of a web application, and how a web browser interacts with a web server. The learner will be introduced to the request/response cycle, including GET/POST/Redirect. The course gives an introductory understanding of Hypertext Markup Language (HTML), as well as the basic syntax and data structures of the PHP language, variables, logic, iteration, arrays, error handling, and superglobal variables, among other elements. An introduction to Cascading Style Sheets (CSS) will allow style markup for web pages.

This course provides analytical, logical and technical capabilities to the learners.

Course Outcomes:

CO1: Explain HTML tags used for formatting static web contents. (Understand)

CO2: Employ CSS and java script constructs to improve the look and feel of websites. (Apply)

CO3: Illustrate various constructs of PHP. (Apply)

CO4: Explain MySql database tables are accessed through PHP front end for insertion, retrieval and modification of data. (Apply)

Content:

Unit 1 (10 hrs.):

Introduction to web, WWW architecture, Fundamentals of HTML, text formatting tags, marquee, inserting images, links, lists, creating tables, frames, working with form elements.

Unit 2 (15 hrs.)

CSS introduction, <link> and <style> elements, CSS properties, Controlling Fonts, Text formatting, Text- pseudo classes, Selectors, Links, Backgrounds, lists.Introduction to Java Script, Java Script variables, operators, decision control statements, looping, functions, arrays, events, popup boxes-alert, prompt, conform box, built-in objects, writing JavaScript, form validation

Unit 3 (15 hrs.)

Introduction to PHP, server side scripting, role of web server software, php comments, variables, echo and print, PHP operators, data types, branching statements, loops, arrays

Unit 4 (16 hrs.)

PHP functions, PHP form, Passing information between pages, $_GET, $_POST, $_REQUEST.
String functions, include and require, session and cookie management, error handling in PHP, Object Oriented Programming using PHP

Unit 5 (16 hrs.)

Introduction to MySQL, datatypes, SQL commands-CREATE, UPDATE, INSERT, DELETE, SELECT, PHP functions for MySQL connectivity and operation- mysql_connect, mysql_select_db, mysql_query, mysql_fetch_row, mysql_fetch_array, mysql_result, mysql_list_fields, mysql_num_fields, insertion, updation and deletion of data using PHP, displaying data from MySQL in webpage.

Text Books:
- ● Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi - "Beginning PHP", Wiley Publishing, Inc
- ● 2. Ivan Bayross - "HTML, DHTML, JavaScript, Pearl & CGI ", Fourth Revised Edition, BPB Publication.

Reference Books:

- ● "Programming PHP",Rasmus Lerdorf and Kevin Tatore, Shroff Publishers & Distributors Pvt. Ltd
- ● "Beginning PHP", Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi, Wiley Publishing, Inc

SEMESTER: 4
CORE COURSE
BC4C10B23 - DATABASE SECURITY FUNDAMENTALS
Credits: 04

Hours per week: 4   **Total Lecture Hours: 72**

Course Context and Overview:

Information systems of today are heavily influenced by database security. The course will provide a thorough overview of database security concepts and techniques, as well as a discussion of new directions in database security relating to Internet information management. In addition to database application security models, database and data auditing, data warehousing, patch management will be discussed based on case studies.

This course helps learners to plan ,design,manage the database security and auditing.

Course Outcomes:

CO1: Discuss database management system functionalities and security fundamentals. (Understand)

CO2: Explain practices of multilevel security and access control mechanisms. (Understand)

CO3: Determine virtual private database technologies and prevention of SQL injection attacks. (Understand)

CO4: Discuss Database auditing and its regulations and compliances. (Understand)

CO5: Describe data warehousing concepts and patch management. (Understand)

Content:
Module 1: (12 hrs)

Introduction : Information system and its components, Database management system functionalities, SQL, Define Security, Security Fundamentals, Database security.

Module 2: (14 hrs)

Multilevel Security (MLS): Best Practices,**Access Control:** Discretionary Access Control(DAC),Access Control Matrix Model ,Implementation of the Access Matrix, Vulnerabilities of the Discretionary Policies, Additional features of DAC.Role Based Access Control(RBAC).

Module 3: (14 hrs)

Virtual Private Databases(VPD) : Virtual Private Database Technology, Purposes/benefits, Implementing a VPD Using Views ,Architecture of Oracle virtual private database,

SQL injection attacks and Countermeasures: SQL Injection, Prevention of SQL Injection.

Module 4: (16 hrs)

DatabaseAuditing: Auditing Overview, definitions, activities, process, objectives, Audit classifications, Types of Audit, Benefits and Side Effects of Auditing.

Regulations and Compliance:HIPAA for healthcare, GLBA for financial services, and Sarbanes-Oxley for public companies. PCI Security Standards, Good Computing Practices.Statistical database.

Module 5:(16 hrs)

Data Warehousing: Metadata and Online Analytical Processing (OLAP)Data mining, Database Vulnerabilities and threats, Vulnerability Scanners, Monitoring and Baselining, Patch management, Procedure for Patch management.

Text Books:

- Sam Afyouni *Database Security and Auditing: Protecting Data Integrity and Accessibility.* Thomson. ISBN: 0-619-21559-3, 2005.

- Marshall D. Abrams, Sushil Jajodia, and Harold J. Podell, eds. *Information Security: An Integrated Collection of Essays*, IEEE Computer Society Press, 1995.

- Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008

- Database security by Silvana Castano, 2nd Edition, Pub:Addison-Wesley Professional, 2008

Reference Books:

- https://www.amazon.com/Information-Security-Integrated-Collection-Essays/dp/0788191985

- https://www.utc.edu/engineering-and-computer-science/caecd/course-listing/cpsc-4670

- Implementing database security and auditing, Ron Ben-Natan, Pub: Digital Press, 1st ed; 2005

SEMESTER: 4

CORE COURSE

BC4C11B23 - PRINCIPLES OF VIRTUALIZATION

Credits: 4

Hours per week:4   **Total Lecture Hours: 72**

Course Overview and Context:

Virtualization is the single most effective way to reduce IT expenses while boosting efficiency and agility in organizations. This course explores the need for virtualization, its types and advantages. This subject provides students with a detailed introduction to virtualisation and hypervisor technologies. It looks at how these technologies are used within an enterprise to achieve various business goals. It further explores the planning, implementation and management of these virtualisation technologies in the context of a virtual infrastructure. Installation and usage of various Virtual machines are illustrated throughout this course.

This course enhances the planning, designing, management as well as technical skills of students.

Course Outcomes:

CO1: Discuss about Virtualization and its different technologies. (understand level)

CO2: Identify how toDeploy, Manage and Access Desktop and Application Virtualization. (understand level)

CO3: Explain different vendor technologies available in the field of Virtualization. (understand level)

CO4: Construct a virtual environment by installing and Configuring Virtual Machines. (apply level)

Content:

Module I: (17 hrs)

Basics of Virtualization: Understanding Virtualization, Need of Virtualization, Virtualization Terminologies, Hypervisor and its types, Virtualization Types: Server Virtualization, Storage Virtualization, I/O Virtualization, Network Virtualization, Client Virtualization, Application virtualization, Desktop virtualization, Understanding Virtualization Uses: Studying Server Consolidation, Development and Test Environments , Helping with Disaster Recovery.

Module II: (9 hrs)

Deploying and Managing an Enterprise Desktop Virtualization Environment: Configure the BIOS to support hardware virtualization; Install and configure Windows Virtual PC: installing Windows Virtual PC on various platforms (32-bit, 64-bit), creating and managing virtual hard disks, configuring virtual machine resources including network resources, preparing host machines.

Module III: (17 hrs)

Deploying and Managing a Presentation Virtualization Environment: Prepare and manage remote applications: Application sharing, Deployment of using RemoteApp, Installing and configuring the RD Session Host Role Service on the server.

Module IV: (16 hrs)

Access published applications: Configuring Remote Desktop Web Access, configuring role- based application provisioning, configuring Remote Desktop client connections. Configure client settings to access virtualized desktops: configuring client settings.

Module V: (13 hrs)

Understanding Virtualization Software: List of virtualization Software available . Vmware- introduction to Vsphere, ESXi, VCenter Server and Vsphere client. Creating Virtual Machine.. Introduction to HYPER-V role. Create Virtual Machines. Create Hyper-v virtual networking, Use virtual Machine Snapshots. Monitor the performance of a Hyper-v server, Citrix XENDesktop fundamentals.

Text Books:

- Virtualization with Microsoft Virtual Server 2005 by TwanGrotenhuis, RogierDittner, Aaron Tiensivu, Ken Majors, Geoffrey Green, David Rule, Andy Jones, Matthijs ten Seldam, Syngress Publications, 2006

- Virtualization--the complete cornerstone guide to virtualization best practices, Ivanka Menken, Gerard Blokdijk, Lightning Source Incorporated, 2008.

Reference Book:

- Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, EBook, 2005

SEMESTER: 4
CORE COURSE
BC4C12B23 - INTRODUCTION TO CLOUD TECHNOLOGY

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course covers cloud technology as a whole. This covers the delivery models, risks and the methodology of cost management and the selection of the services offered by the Service provider.

This course gives an insight into the basics of cloud computing along with virtualization, Business considerations and the concepts of Edge computing.This is the foundation course to learn better understanding about the various types of cloud platforms and its applications.

This course offers employabilty with diverse job roles as Cloud Analyst,DevOps Engineer,Cloud Architect etc.

Course Outcomes:

CO1: Describe Cloud Computing concepts. (Understand)

CO2: Practice migration approaches in the Cloud. (Apply)

CO3: Determine the best practices, risks and mitigation in cloud services. (Apply)

CO4: Discuss Cloud applications and Governance of cloud services. (Understand)

CO5: Examine cloud platforms, services and its providers. (Apply)

Content:

Module I: (15 hrs)

Introduction: Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing. Impact of 5G on cloud services

Module II: (16 hrs)

Cloud Computing Companies and Migrating to Cloud: Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud, Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies.Serverless computing

Module III: (16 hrs)

Cloud Cost Management and Selection of Cloud Provider: Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application. Considerations for selecting cloud solutions. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration.Concept of Edge computing.

Module IV: (15 hrs)

Governance in the Cloud: Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations.

Module V: (10 hrs)

Cloud Platforms in Industry: Amazon Web Services, Google AppEngine, Microsoft Azure, Kubernetes/Blockchain.Applications: Scientific Applications, Business and Consumer Applications.

Text Books

- Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej M.Goscinski,, John Wiley and Sons Publications, 2011

- Brief Guide to Cloud Computing, Christopher Barnett, Constable & Robinson Limited, 2010

Reference Book

- Handbook on Cloud Computing, Borivoje Furht, Armando Escalante, Springer, 2010

SEMESTER: 4
CORE COURSE
BC4C13B23 - ETHICAL HACKING FUNDAMENTALS
Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course covers the Ethical Hacking methodology and its different stages. It describes a wide range of attacks that can cause adverse negative effects on IT systems that include Denial of service, Session Hijacking and severe vulnerabilities that can be seen in Web Applications. It also covers Hacking attacks caused in other Operating System environments like Linux and the secret techniques to Evade Firewalls. This course captures valuable information on vulnerabilities and also covers an effective way of report making methodology that can help the top level management to take immediate decisions on mitigating the threats.

This course offers employability to the learners in various roles such as Malware Analyst, Penetration TesterInformation security analyst etc. They work to prevent sensitive data from falling into enemy hands. They safeguards the company from blackmail by those willing to exploit the vulnerabilities. Via real-world testing, they can enhance digital network security and prevent security breaches.
This course teaches the learners to be on ethical side during professional personal activities.

Course Outcomes:

CO1: Illustrate the concepts and techniques in Ethical Hacking. (Apply)

CO2: Examine different cyber-attacks and it's countermeasures. (Apply)

CO3: Discuss web application vulnerabilities and hacking in different platforms. (Apply)

CO4: Illustrate vulnerability mitigation & its reporting. (Understand)

CO5: Describe the liabilities & legal systems related to cyber security. (Understand)

Content

Module I: (10 hrs.)

Introduction to Ethical Hacking: Ethical Hacking, why is it necessary, scope and limitations, skills required, phases of ethical hacking, tools and techniques, Black Box, Gray Box and White Box techniques, differences between vulnerability assessment, ethical hacking and penetration testing, Reverse engineering, Ethical hacking terminology, Exploit, Vulnerability – Zero-day, manual PT, Case Studies on data breaches and cybercrimes involving hacking

Module II: (15 hrs.)

Ethical Hacking through Attacks and Exploits: EH methodology, attacks, exploits, Denial of Service, Sniffers, malware, Session Hijacking and ethical hacking of Web Servers and applications, Password Cracking, Keylogger, Hash Injection attack, replay and man-in-the- middle attacks, rainbow table attack, distributed network attack, spoofing, phasing, spyware, rootkits, hiding files, counter measures

Module III: (16 hrs.)

Web and Network Hacking: Enumeration and scanning, host discovery, type of scanning – TCP SYN, ACK, XMAS & UDP Port scanning, SQL Injection, Social Engineering, Buffer Overflows, Input data validation, physical penetration attacks, Hacking Wireless Networking, Hacking mobile platforms, Windows and Linux Hacking, Evading IDS, Firewalls and Honeypots, DDoS attacks, using metasploit, counter measures

Module IV: (16 hrs.)

Report Writing & Mitigation: Introduction to Report Writing & Mitigation, requirements for low level reporting & high-level reporting of Penetration testing results, Demonstration of vulnerabilities and mitigation of issues identified including tracking, CVSS scoring for vulnerabilities, rating and prioritization, impact of these in reporting

Module V: (15 hrs.)

Ethical Hacking and Legal System: Overview of India's Information Technology Amendment Act 2008 (IT Act 2008), hacker vs cracker, liabilities – civil and penal, cyber theft and IPC sec 378, IT Act 2008 – sections 43, 65 and 66, how to file a complaint of suspected hacking, Case Studies, understanding how hacking is legally dealt with among BRICS countries.

Text Books:

- Gray Hat Hacking The Ethical Hackers Handbook, 3rd Edition Paperback – 1 Jul 2017 by Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, McGraw Hill Education; 3 ed (1 July 2017)

- CEH v9: Certified Ethical Hacker Version 9 Study Guide by Sean-Philip Oriyano, Sybex;Stg edition (17 June 2016)

- Hacking for Beginners: Ultimate 7 Hour Hacking Course for Beginners. Learn Wireless Hacking, Basic Security, Penetration Testing by Anthony Reynolds, Create Space Independent Publishing Platform (10 April 2017)

- An Ethical Guide To WI-FI Hacking and Security by SwaroopYermalkar, BecomeShakespeare.com; First edition (15 August 2014)

- Hands-On Ethical Hacking and Network Defense by Michael T. Simpson | Kent Backman | James Corley, Cengage India 1st edition (2016)

Reference Books:

- The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson, Syngress; 2 edition (12 September 2013)

- Hacking With Python: The Complete Guide to Ethical Hacking, Basic Security, Botnet Attack, Python hacking and Penetration Testing Kindle Edition by John C. Smalls

SEMESTER: 4
CORE COURSE

BC4CP04B23 - SOFTWARE LAB-IV

Credits: 2

Hours per week:5   **Total Lecture Hours: 90**

Course Outcomes:

CO1:   Examine various cyber attacks and construct security tools. (Apply)

CO2:   Devise the phases in ethical hacking. (Create)

CO3:   Simulate the services of AWS and Google Cloud. (Apply)

CO4:   Design web applications in cloud. (Create)

I.   **INTRODUCTION TO CLOUD TECHNOLOGY – LAB (2 hrs per week)**

   Content:

1. Study the basic cloud architecture and represent it using a case study

2. Enlist Major difference between SAAS PAAS &Iaas also submit a research done on various companies in cloud business and the corresponding services provided by them, tag them under SAAS , Paas&Iaas.

3. Present a report on google cloud and other cloud services

4. Present a report on obstacles and vulnerabilities in cloud computing on generic level

5. Present a report on Amazon cloud services.

6. Present a report on Microsoft cloud services.

7. Present a report on cost management on cloud

8. Enlist and explain legal issues involved in the cloud with the help of a case study

9. Explain the process of migrating to cloud with a case study.

10. Study various services available on AWS cloud platform

II.   ETHICAL HACKING (3 hrs per week)

Content:

1. Explore the knowledge on Passive Reconnaissance using "Who is" and Online tools

2. Understand about the Active Reconnaissance using "Sam pad" and web site details

3. Understand about the Full Scan, Half Open Scan and Stealth scan using "nmap"

4. Understand about the UDP and Ping Scanning using "Advance LAN Scanner" and "Superscan"

5. To gain knowledge on Packet crafting using "Packet creator" tools

6. Gain exposure on Exploiting NetBIOS vulnerability

7. To gain knowledge on Password Revelation from browsers and social networking application

8. Gain exposure on Creating and Analyzing spoofed emails

9. To gain knowledge on Creating and Analyzing Trojans

10. Gain exposure on OS password cracking.

Scheme of Evaluation for software lab III external is as follows:

(There will be two questions, the first from Introduction to cloud and second from Ethical hacking)

Division of Marks (Practical - 3 hours External)

First questions from Introduction to Cloud Technology - 25 marks

1. Logic – 10 marks

2. Successful compilation – 8 marks

3.   Result – 7 marks

Second questions from Ethical Hacking - 35 marks

1.   Logic   – 20 marks

2.   Successful compilation –10 marks

3.   Result – 5 marks

Viva Voce   - 10 marks

Lab Record   - 10 marks

(Introduction to cloud -Minimum of 10 Programs Ethical hacking – Minimum of 10 Programs)

Total Marks - 80 marksDivision of Marks (Practical - 3 hours External)

First questions from Introduction to Cloud Technology - 25 marks

1.   Logic   – 10 marks

2.   Successful compilation – 8 marks

3.   Result – 7 marks

Second questions from Ethical Hacking - 35 marks

1.   Logic   – 20 marks

2.   Successful compilation –10 marks

3.   Result – 5 marks

Viva Voce   - 10 marks

Lab Record   - 10 marks

(Introduction to cloud -Minimum of 10 Programs Ethical hacking – Minimum of 10 Programs)

Total Marks - 80 marks

SEMESTER: 5

CORE COURSE

BC5C14B23 - IT, ENVIRONMENT AND HUMAN RIGHTS

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context

This course helps to create an awareness about environmental problems among people. This course helps to impart basic knowledge about the environment and its allied problems. This will help in developing an attitude of concern for the environment. It motivates the public to participate in environment protection and environment improvement. This course acquires skills to help the concerned individuals in identifying and solving environmental problems. This is a lesson for striving to attain harmony with Nature. This course also provides an insight to various IT resources available in the context of education as well as provides an awareness about the human rights available to the public.

This course enhances the analytical capabilities of students.

Course Outcomes:

CO1: Discuss the scope and importance of natural resources and ecosystems. (Understand)

CO2: Explain the biodiversity, its conservation, environmental issues and its solutions. (Understand)

CO3: Observe the integration of the internet in education. (Understand)

CO4: Discover the impact and opportunities of information technology on society. (Understand)

CO5: Identify the effectiveness of human rights practice on national, international and environmental facets. (Understand)

Content

Module I: (18 hrs.)

Multidisciplinary nature of environmental studies: Definition, scope and importance,

Need for public awareness.

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

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

Module II: (26 hrs.)

Biodiversity and its conservation: Introduction, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values., India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India (8 hrs.) Environmental Pollution :Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes., Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides. (8 hrs.)

Social Issues and the Environment: Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns.

Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies, Consumerism and waste products, Environment Protection Act , Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Module III: (10 hrs.)

Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, open access publishing models, Introduction to use of IT in teaching and learning -Educational software, Academic services– INFLIBNET, NPTEL, NICNET, and BRNET.

Module IV: (10 hrs.)

IT & Society- issues and concerns- digital divide, IT & development, the free software movement , IT industry: new opportunities and new threats, software piracy, cyber ethics, cybercrime, cyber threats, cyber security, privacy issues, cyber laws, cyber addictions, information overload, health issues- guidelines for proper usage of computers, internet and mobile phones. e-wastes and green computing, impact of IT on language & culture-localization issues- Unicode- IT and regional languages, Green Computing Concept.

Module V: (8 hrs.)

Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

Human Rights and United Nations – contributions, main human rights related organs - UNESCO,UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights. Human Rights in India – Fundamental rights and Indian

Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirengan report. Overexploitation of groundwater resources, marine fisheries, sand mining etc.

Text Books:

- Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)

- Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)

- Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)

Reference Books:

- "Technology in Action" Alan Evans, Kendall Martin, Mary Anne Poatsy, Pearson

- Clark.R.S., Marine Pollution, Clanderson Press Oxford

- Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .

- Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.

- Down to Earth, Centre for Science and Environment

- Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb

- Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p

- Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p

- Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p

- Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p

- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut

- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science

- Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media

- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication

- Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

SEMESTER: 5

CORE COURSE

BC5C15B23 - CRYPTOGRAPHY FUNDAMENTALS

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course throws light on the three building blocks of Information Security viz, CIA Triad ,its concepts and practices which enables the organizational business to protect data. In order to know the nuances of cryptographic technology it focuses on the different types of Crypto/Hash Algorithms.It emphasizes the need of understanding the Key management and the technology used to implement a well-defined encryption and decryption policy. It covers the underlying vulnerabilities in today's widely used cryptographic functions and the precautionary measures while using the function. Conclusively, helps the learner to understand the importance of Certifying Authority, Public Key Infrastructure and the System requirements for implementing Cryptographic functions.

This course equips the learners with logical and technical skills.

Course Outcomes:

CO1:Describe the methodologies, practices and uses of cryptography. (Understand)

CO2: Examine the various Cryptographic algorithms. (Apply)

CO3: Determine the key management process, and its applications in cryptography. (Apply)

CO4: Discuss the security vulnerabilities of a cryptosystem and its countermeasures. (Understand)

Content

Module I : **Introduction of Cryptography:** Cryptographic Concepts, Methodologies and Practices, CIA Triads,Network Security,Cryptographic Attacks, Services and Mechanism, Techniques. **Mathematics of Cryptography:** Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence.

Module II: **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.

Module III: **Mathematics of Asymmetric-Key Cryptography:** Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm. **Asymmetric Key Cryptography**: Introduction, RSA Cryptosystem, Elgamal Cryptosystem, Diffie–Hellman Key Exchange Protocol,Elliptic Curve Cryptosystems,Quantum Cryptography.

Module IV: **Cryptography Hash Functions:** Introduction, Description of MD Hash Family, SHA-512, HMAC,**Digital Signature:** Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Schemes, Variations and Applications. **Key Management:** Symmetric-Key Distribution, Kerberos, X.509 Certificate,Symmetric-Key Agreement, Public-Key Distribution, Hijacking,Use and functions of Certifying Authorities (CAs).

Module V: **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.

Text Books:

- Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1sted; 2008

- Cryptography and Security by C K Shyamala, N Harini and Dr T R Padmanabhan, Wiley India, 1sted; 2011

- Cryptography and Network Security by AtulKahate, McGraw Hill India, 3rded; July 2017

- Cryptography and Network Security by S. Bose, Pearson India, 1sted; Mar 2016

- Cryptography and Information Security by V. K. Pachghare, Prentice Hall India, 2nd rev ed; 2015

Reference Books:

- Understanding Cryptography: A Textbook for Students and Practitioners Hardcover, Springer, 1sted; 2010

- Introduction to Modern Cryptography by Jonathan Katz, Chapman & Hall/CRC Cryptography, 2nded; 2014

- Everyday Cryptography: Fundamental Principles & Applications by Keith Martin, OUP Oxford, 2nded; 2017

SEMESTER: 5
CORE COURSE

BC5C16B23 - COMPUTER FORENSICS AND INVESTIGATION

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context

In this course, the student will learn the principles and techniques for digital forensics investigation and the spectrum of available computer forensics tools. The core forensics procedures to ensure court admissibility of evidence, as well as the legal and ethical implications are discussed here. This course also focuses on performing a forensic investigation on both Unix/Linux and Windows systems with different file systems. A guidance to forensic procedures, review and analyzing forensics reports are also provided here.

This course offers jobs in various roles such as Cyber Forensic Analyst, Computer Forensics Investigator, Security Consultant etc.

Course Outcomes:

CO1: Identify the importance of Computer Forensics and investigation procedure. (Understand Level)

CO2: Practice Cyber Forensics Tools and Techniques. (Apply)

CO3: Discuss the data recovery processes in storage devices. (Understand Level)

CO4: Review cyber laws and IT Act. (Understand Level)

Content

Module I: (10 hrs.)

Understand the Importance of Computer Forensics.

Computer Forensics: Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non-technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure

Module II: (15 hrs.)

Learn to identify and trace Passwords, E-mail using Forensics Tools.

Storage Devices & Data Recover Method:Storage Devices- Magnetic Medium, Non-magnetic medium and Optical Medium. Working of Storage devices-Platter, Head assembly, spindle motor. Data Acquisition, Data deletion and data recovery method and techniques.

Module III: (15 hrs.)

Acquire skills to perform how Data works on Storage Devices & the Recovery Devices. Forensics Techniques: Windows forensic, Linux Forensics, Mobile Forensics, Stegnography, Application Password cracking-Brute force, Dictionary attack, Rainbow attack. Email Tacking – Header option of SMTP, POP3, and IMAP.

Module IV: (16 hrs.)

Corporate espionage, Evidence handling procedure, Chain of custody, Main features of Indian IT Act 2008 (Amendment).

Module V: (16 hrs.)

Gain Knowledge about Cyber Laws. Cyber Law sections.

Text Books:

- Computer Forensics: Computer Crime Scene Investigation by John Vacca, Laxmi Publications, 1sted; 2015

- Digital Forensic: The Fascinating World of Digital Evidences by Nilakshi Jain, et.al, Wiley, 1sted; 2016

- The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Syngress, 2nded; 2014

- Cyber Forensics in India: A Legal Perspective by Nishesh Sharma, Universal Law Publishing - an imprint of LexisNexis; First 2017 edition

- Network Forensics:Tracking Hackers Through by Davidoff, Pearson India, 2013

Reference Books:

- Hacking Exposed Computer Forensics by Aaron Philipp, David Cowen, McGraw Hill, 2nded; 2009

- Mastering Mobile Forensics by SoufianeTahiri, Packt Publishing, 1sted; 2016

- Computer Forensics: A Beginners Guide by David Cowen, McGraw Hill, 1sted; 2013

- Practical Digital Forensics Kindle Edition by Richard Boddington, Packt Publishing, 1sted; July 2016

- Learning Network Forensics by Samir Datt, Packt Publishing, 1sted; 2016

SEMESTER: 5
CORE COURSE

BC5C17B23 - INTRODUCTION TO PYTHON PROGRAMMING

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course provides an introduction to Python language. It covers the core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files. This course delves deeper into essential programming topics.

This course enhances logical and programming skills.

Course Outcomes:

CO1: Illustrate various control structures and data structures in Python. (Apply)

CO2: Describe procedural and object oriented concepts. (Understand)

CO3: Examine modules, packages and exception handling in Python. (Apply)

CO4: Illustrate database and GUI Programming. (Apply)

CO5: Explain regular expression and python libraries. (Apply)

Content

Module I: (12 hrs)
Introduction to Python: Features of Python, How to Run Python, Identifiers, Reserved Keywords, Variables, Input, Output and Import Functions, Operators. **Data Types**: Numbers, Strings, List, Tuple, Set, Dictionary, Data Type Conversions. **Decision Making-** if,nested if, elif,Loops, Nested Loops, Control Statements,

Module II (14 hrs)

Function-Function Definition, Function calling, Function arguments, Lambda Functions, Recursive Functions. **File Handling-**creating file,reading and writing to a file. **Object Oriented Programming**: Class definition, Creating objects, Encapsulation, Data hiding, Inheritance, Method overriding, Polymorphism.

Module III (14 hrs.)

Modules & Packages: Creating Modules, import Statement, Locating Modules, Namespaces and Scope, Packages, Date and Time Modules. **Exception Handling**: Built-in Exceptions, Handling Exceptions, Exceptions with arguments, Raising an Exception, User-defined Exception, Assertions in Python.

Module IV (16 hrs)

Database Programming: Connecting to a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, Exception Handling in Databases.**GUI Programming:** Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples

 Module V (16 hrs)

Regular expressions: Introduction, match() function, search() function, search and replace, regular expression modifiers, regular expression patterns, Character classes, special character classes, repetition cases, findall() method, compile() method. **Python libraries**-Introduction to python libraries, numpy,pandas,Scikit-learn,TensorFlow,Keras, SciPy..etc.

Text Books:

- Wesley J. Chun, Core Python Applications Programming, 3rd Edition , Pearson Education, 2016

- Charles Dierbach, Introduction to Computer Science using Python, Wiley, 2015
  3. Jeeva Jose &P.SojanLal, Introduction to Computing and Problem Solving with PYTHON, Khanna Publishers, New Delhi, 2016

- Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015 Suggested MOOC 1.

References:

- https://archive.org/details/MIT6.00SCS11

- https://www.coursera.org/course/pythonlearn

- http://www.learnerstv.com/Free-7)Computer-Science-Video-lectures-ltv163-Page1.htm

- https://www.coursera.org/learn/python-databases

SEMESTER: 5

CORE COURSE

BC5CP05B23 - SOFTWARE LAB-V

Credits: 2

Hours per week: 5   **Total Lecture Hours: 90**

Course Outcomes:

CO1: Apply different data types, functions and object-oriented principles in programming. (Apply)

CO2: Analyze data using Pandas library and Numpy package. (Apply)

CO3: Practice Cyber Forensics Tools and Techniques. (Apply)

INTRODUCTION TO PYTHON PROGRAMMING – LAB (2 hrs. per week)

Content:

1. Introducing Anaconda
2. Programs for introducing Input and Output
3. Programs for introducing Variables and Functions
4. Programs for introducing Loops and conditionals
5. Programs for introducing Strings
6. Programs for introducing Lists
7. Programs for introducing Tuples
8. Programs for introducing Sets
9. Programs for introducing Dictionaries
10. Programs for introducing Files
11. Programs for introducing Classes
12. Programs for introducing Array
13. Programs for introducing Python - Regular Expressions
14. Introduce Database connectivity
15. Programs on Packages

16. Programs on Numpy

17. Programs on Numpy

18. Programs on Pandas and Data Visualization:

19. Creating a form using Tkinter

II.   COMPUTER FORENSICS AND INVESTIGATION - LAB (3 hrs. per week)

content:

Module 1

Understand the Physical Collection of electronic evidence using forensic standards and to gain knowledge about the Dismantling and re-building PCs in order to access the storage media safely

Module 2

To know about Boot sequence and Power On Self-Test mode analysis and to understand about the Examination of File systems of Windows, Linux and Mac

Module 3

To gain knowledge about the Analyzing Word processing and Graphic file format and to understand the basic Network data sniffing and analyzing

Module 4

To know about the Password and encryption techniques and get enough skills how to perform Internet forensic and Malware analysis

Module 5

To know on how Data recovery techniques for hard drive and attain skills of how to execute Data recovery techniques for Pen drive and CD

Scheme of Evaluation for software lab III external is as follows:

(There will be two questions, the first from Linux Administration and second from Computer Forensics)

Division of Marks (Practical - 3 hours External)

First questions from Python - 25 marks

1.   Logic   – 10 marks

2.   Successful compilation – 8 marks

3.   Result – 7 marks

Second questions from Computer Forensics Lab - 35 marks

1.   Logic   – 20 marks

2.   Successful compilation –10 marks

3.   Result – 5 marks

Viva Voce - 10 marks

Lab Record   - 10 marks

(Computer Forensics -Minimum of 10 Programs Linux Administration – Minimum of 15Programs)

Total Marks - 80 marks

SEMESTER: 6
CORE COURSE

BC6C18B23- IT, GOVERNANCE, RISK AND INFORMATION SECURITY MANAGEMENT

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

Firms make significant investments in IT. In this course we will discuss how to govern IT to make sure that the IT investments contribute to organizational goals and strategies.Firms need to formally evaluate significant IT investments. We will discuss how to evaluate IT investments,and evaluate a portfolio of IT investments. Firms need a mechanism to charge users for the IT investments made to encourage prudent consumption of IT resources. We will discuss different mechanisms for charging for IT that encourage users to spend IT dollars wisely.Finally, IT investments are made to generate value for the firm. This requires that employees actually use the new IT systems that are developed. Thus, in the IS/IT Governance course we will discuss strategies to make sure that users use the new system so that the firm derives value from its IT investments.

This course enhances analytical skills

Course Outcomes:

CO1: Explain the concepts in IT Governance and associated concepts. (Understand)

CO2: Illustrate the Risk Management Process. (Understand)

CO3: Discuss about Information Security Management. (Understand)
CO4: Identify the frameworks ISACA and COBIT. (Understand)

Content

Module I: (16 hrs.)

IT Governance: Introduction & Concepts, Role of Governance in Information Security, Best Practices for IT Governance Role of IT Strategy Committee, Standard IT Balanced Scorecard. Val-IT framework of ISACA

Module II: (14 hrs.)

Information Systems Strategy: Role of Strategic Planning for IT, Role of Steering committee, Policies and Procedures

Module III: (16 hrs.)

Risk Management Program: Develop a Risk Management Program. Risk Management Process, Risk Analysis methods

Module IV: (12 hrs.)

Information Security Management: Introduction, Performance Optimization, IT Security roles & responsibilities, Segregation of Duties.

Module V:(14 hrs.)

Frameworks – ISACA, COBIT: Risk-IT Framework of ISACA, Description of COBIT and other Frameworks

Text Books:

- Information Security Governance by S.H. Solms, Rossouw Solms, Springer; 1st Edition. 2nd Printing, 2008 edition (12 December 2008)

- IT Governance: How Top Performers Manage IT Decision Rights for Superior Results by Weill, Harvard Business Review Press; First edition (1 June 2004)

- ISACA publications

Reference Books:

- Managing Risk and Information Security by Malcolm Harkins, Apress; 1 edition, 2012

- IT Governance: An International Guide to Data Security and ISO27001/ISO27002 by Alan Calder, Steve Watkins, Kogan Page; 6 edition (3 September 2015)

- ISACA publications on COBIT, RiskIT and ValIT

- Information Security Governance: Guidance for Information Security

Managers by

- W. Krag Brotby and IT Governance Institute, Isaca (2 June 2008)

- COBIT 5 Framework Perfect by Isaca, (10 April 2012)

- Cobit 5 Foundation-reference and Study Guide by Ana Cecilia Delgado, CreateSpace Independent Publishing Platform; Stg edition (20 June 2016)

- Governance of Enterprise IT Based on COBIT 5: A Management Guide by Geoff

- Harmer (Author), IT Governance Publishing, (6 February 2014)

SEMESTER: 6

CORE COURSE

BC6C19B23 - MOBILE, WIRELESS AND VOIP SECURITY

Credits: 4

Hours per week:4   **Total Lecture Hours: 72**

Course Overview and Context:

This course concentrates on the basis of Mobile & Telecommunication Protocols along vulnerabilities.It explains about managerial, technical & procedural controls to address Wireless Vulnerabilities, VoIP Vulnerabilities. It covers Mobile Forensics processes having Seizure and the data extraction types like physical, logical and manual along external & internal memory, storage, analysis using tools & techniques.

This course enhances the technical skills of the learner.

Course Outcomes:

CO1: Discuss the concepts in Mobile communication. (Understand Level)

CO2: Understand the inherent vulnerabilities and control measures in wireless networks. (Understand

   Level)

CO3: Describe vulnerabilities and control measures in VoIP. (Understand Level)

CO4: Illustrate mobile forensics investigation process. (Understand Level)

Content:

Module I:(18 hrs.)

Introduction to Mobile communication: Mobile & Telecommunication protocols and their vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address Mobile & Telecommunication vulnerabilities.

Module II: (18 hrs.)

Wireless Security: Wireless protocols and their vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address Wireless vulnerabilities.

Module III: (18 hrs.)

Voice over Internet Protocol (VOIP) Security: VOIP concepts, protocols and vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address VOIP vulnerabilities.

Module IV: (18 hrs.)

Mobile Forensics & Data Extraction: Mobile forensics process including seizure, data acquisition types like Physical, Logical, Manual, External & Internal memory, storage, analysis using tools & techniques.

Text Books:

- Mobile Application Security by Himanshu Dwivedi, Chris Clark, David Thiel by McGraw Hill Education (1 July 2017)

- Wireless Network Security A Beginner's Guide by Tyler Wrightson, McGraw Hill Education; 1 edition (25 June 2012)

- Mobile Security: How to Secure, Privatize and Recover Your Devices Paperback by Tim Speed, Darla Nykamp, Mari Heiser, Joseph Anderson, Packt Publishing Limited (10 August 2013)

- Mastering Mobile Forensics by Soufiane Tahiri, Packt Publishing Limited (30 May 2016)

- Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Reference Books:

- Mobile Forensics: Advanced Investigative Strategies by Oleg Afoninis, Vladimir Katalov, Packt Publishing Limited (30 September 2016)

- Practical VoIP Security by Thomas Porter, Syngress (31 March 2006)

- The Mobile Application Hacker's Handbook (MISL-WILEY) by Dominic Chell, Tyrone Erasmus, Shaun Colley, Wiley (2015)

- Wireless Hacks 2e by Rob Flickenger, Roger Weeks, O'Reilly; 2 edition (9 December 2005)

- Network Security Bible by Eric Cole, Wiley; Second edition (2009)

- Security Aspects for Voip Systems by Alotaibi Mutlaq, LAP Lambert Academic Publishing (28 May 2015)

SEMESTER: 6

CORE COURSE

BC6C20B23 - INTRODUCTION TO WINDOWS AZURE

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The course seeks to cover the holistic perspective of Windows Azure on infrastructure perspective. This course will help to master the Azure infrastructure by understanding Azure Cloud Architect Technology Solutions, implementing workloads and security in Azure. It also helps one to learn creating and deploying apps in Azure and securing data in Azure. It discusses how this service can be used by different other services.

Course Outcomes:

CO1: Illustrate the creation and configuration of Virtual Machines in Azure. (Understand Level)

CO2: Discuss the various networking concepts in Azure. (Understand Level)

CO3: Identify the different storage services and automation mechanisms in Azure. (Understand Level)

CO4: Describe the importance and configuration of SQL DB in Azure. (Understand Level)

CO5: Illustrate the creation and management of websites in Azure. (Understand Level)

Content:

Module I: (14 hrs.)

Introduction: Introduction to MS. Azure, Virtual Machines: Creating Virtual Machines, Difference Between Basic and Standard VMs,Logging in to a VM and Working, Attaching an empty Hard Disk to VM, Hosting a Website in VM , Configuring End Points, Scaling up and Down, Creating a custom Image from VM,Creating a VM from a custom Image, Shut down VM without Getting Billed,VM Pricing

Module II: (16 hrs.)

Managing Infrastructure in Azure: Managing Infrastructure in Azure: Azure Virtual Networks, Highly Available Azure Virtual Machines, Virtual Machine Configuration Management, Customizing Azure Virtual Machine Networking. Load Balancing: Creating Cloud Services, Adding Virtual Machines to a Cluster, Configuring Load Balancer.

Module III: (16 hrs.)

Windows Azure: Azure Storage: What is a Storage Account,Advantages, Tables, blobs, queues and drives, Azure Appfabric: Connectivity and Access control Automation: Introduction Windows Power Shell ,Creation of Runbooks, Uploading a Shell Script, Authoring a Shell Script.

Module IV: (14 hrs.)

 SQL Azure: Creating a SQL Server, Creating a SQL DB, Creating Tables, Adding Data to the Tables, View Connection Strings, Security Configurations, Migrating on premise DB to SQL Azure.

Module V: (12 hrs.)

Websites: Creating a Website, Setting deployment credentials, Choosing a platform, Setting up Default page for website, Scaling ,Auto Scaling by Time, Auto Scaling by Metric, Difference between Free, Shared, Basic and Standard websites, Creating a website using Visual studio

Text Book:

- • Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference Books:

- • Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011

- • Windows Azure Step By step by Roberto Brunetti

SEMESTER: 6
CORE COURSE

BC6CSB23 - SEMINAR

Credits: 1

Hours per week: 2   **Total Lecture hours: 36**

Course Overview and Context:

This course encourages students to demonstrate critical thinking, collaboration, and academic research skills on topics of the student's choosing.The course provides integrated activities of reading, research, discussion, and composition around a designated subject. This course is designed to provide sustained, rigorous investigation of a topic.

This course enhances the Technical, research, documentation and presentation skills of the learner.

Course Outcomes:

CO1: Facilitate communication, documentation and presentation skills. (Create level)

CO2: Explain a recent technology from the domain of study. (Analyze level)

Seminar Presentation:

Each student can choose the latest topic of current day interest in the areas of Computer Science / Information Technology and present a seminar presentation using appropriate presentation media. A seminar presentation report in bound form in the pattern of a complete technical report (with contents page, well-structured presentation, references etc.) should be submitted. There will not be any external evaluation for Seminar Presentation.

Scheme of Evaluation of Seminar Presentation (core) for INTERNAL is as follows:

Components of Internal Evaluation of Seminar	Marks
Demonstration and Presentation	40

Knowledge in the topic	20
Novelty of the topic	10
Seminar Report	10
Promptness	20
Total	**100**

SEMESTER: 6
CORE COURSE

BC6PRB23 - PROJECT
Credits: 3
Hours per week:7   **Total Lecture hours:** 126

Course Overview and Context:

This offers the opportunity to apply and extend material learned throughout the program. After the completion of this course, students will be able to design solutions to complex real world problems utilizing a systems approach

This course enhances the Planning, designing, developmental, technical, programming, research, documentation and presentation skills of the learner.

Course Outcomes:

CO1: Develop communication, documentation and presentation skills. (Create level)

CO2: Analyze a problem and its technical solutions from the domain of study. (Analyze level)

CO3: Develop solution to the identified problem. (Create level)

Project Presentation:

The project topic shall be chosen from areas of current day interest using latest packages / languages running on appropriate platforms, so that the student can be trained to meet the requirements of the Industry. A project report should be submitted in hard bound complete in all aspects. For internal evaluation, the progress of the student shall be systematically assessed through various stages of evaluation at periodic intervals.

Scheme of Evaluation for Project is as follows:

Components of External Evaluation of Project		Marks
Demonstration and Presentation		40
Project Viva		20
Project Report		20
Total		**80**

* Bonafide report of the project work conducted shall be submitted at the time of examination.

Components of Internal Evaluation of Project	Marks
Attendance	5
Review 1	5
Review 2	5
Demonstration and Viva	5
Total	**20**

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SEMESTER: 6
CORE COURSE

BC6CVB23 -VIVA VOCE

Credit: 1

Course Overview and Context:

This course assesses the overall knowledge of the student in the field of information technology, cloud technology, information security. This course shall ensure that the students are able to present the knowledge, skills and practical they undertake should be presented to the panel of experts in the most effective way.

Course Outcomes:

CO1: Summarize the major concepts of computer fundamentals, programming languages, cloud technology and information security. (Understand level)

Scheme of Evaluation of Viva voce (core) for External is as follows:

Each student should attend a course viva voce based on syllabus from semester I to semester IV

SYLLABI

FOR

OPEN COURSES

SEMESTER: 5

OPEN COURSE

BC5D01AB23 - INFORMATICS AND CYBER ETHICS

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The course provides an insight to the internet and various services provided by the internet and also provides an overview of the different cyber laws and ethics to be followed. This course covers ethical and professional issues that arise in designing and using networked information technologies and information resources. It examines frameworks for making ethical decisions, emergent technologies and their ethical implications, and information and computer professionalism.

It enhances the logical and analytical capabilities of students.

Course Outcomes:

CO1: Explain the basic working of the Internet and its main services. (Understand)

CO2: Discuss role of internet as a knowledge repository. (Understand)

CO3: Describe concept of IPR. (Understand)

CO4: Discuss relevance of cyber ethics and its violations. (Understand)

CO5: Examine impact of IT on aspects like health, environment, language & culture. (Understand)

Content:

Module I: (12 hrs.)

The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs, Electronic mail.

Module II (16 hrs.)

Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, opens access publishing models, Introduction to use of IT in teaching and learning -Educational software, Academic services–INFLIBNET, NPTEL, NICNET, BRNET.

Module III (16 hrs.)

Introduction to purchase of technology, License, Guarantee, Warranty, Basic concepts of IPR,

copyrights and patents, plagiarism. IT & development, the free software movement.

Module IV (14 hrs.)

Cyber space, information overload, cyber ethics, cyber addictions, cybercrimes– categories –person, property, Government–types-stalking, harassment, threats, security & privacy issues.

Module V(14 hrs.)

Cyber Addiction, Information Overload, Health Issues, e-Waste and Green computing impact of IT on language & culture-localization issues- Unicode- IT and regional languages e-Governance in India, IT for National Integration, Role of IT

Text Books
   • Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson

References:

   • Dinesh Maidasani "Learning Computer Fundamentals, MS Office and Internet & Web Technology", Firewall Media, Lakshmi Publications.
   • V Rajaraman - "Introduction to Information Technology", Prentice- Hall of India.
   • Barkhs and U. Rama Mohan - HTML Black Book 3. "Cyber Law Crimes", Asia Law House,New Edition
   • Peter Nortons- Introduction to computers

SEMESTER: 5

OPEN COURSE

BC5D01BB23 - SECURITY THREATS AND TRENDS

Credits: 3

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course provides an introduction, concepts, various types of security threats, technical, managerial and procedural controls to address viruses, worms, malwares, botnets, trojans, rootkits. This course also gives knowledge about advanced persistent threats and information warfare. Their working methods, security implications, managerial, technical and procedural controls to address these threats are also discussed here.

This course enhances the technical skills of the learner.

Course Outcomes:

CO1: Discuss virus, worms and its control mechanisms. (Understand)

CO2: Describe malware, botnets, honeypots and its control mechanisms. (Understand)

CO3: Discuss trojans, rootkits and its control mechanisms. (Understand)

CO4: Identify the advanced persistent threats and threat welfare, its working and security implications. (Understand)

Content

Module I: (12 hrs.)

Understand about the viruses & worms: Introduction to Viruses &Worms, the concept of how Viruses & Worms work, the various types of Viruses &Worms, the infection vectors of Viruses &Worms, managerial, technical & procedural controls to address Viruses & Worms

Module II: (15 hrs.)

Understand about the malware & botnets: Introduction to Malware & Botnets, the concept of how Malware, Trojans & Botnets work, the concept of Honeynets and Honeypots, Managerial, technical& procedural controls to address Malware, Trojans & Botnets.

Module III: (15 hrs.)

Understand about the Trojans & rootkits: Introduction to Remote Access Trojans &

Rootkits, concepts, their working methods, their security implications and the managerial, technical and procedural controls to address RATs.

Module IV: (15 hrs.)

Learn to identify the advanced persistent threats & threat warfare: Introduction to Advanced Persistent Threats &Information Warfare, concepts, their working methods, their security implications and the managerial.

Module V: (15 hrs.)

Learn how to address threats and possible attacks: Technical and procedural controls to address these threats.

Text Books:

- Future Crimes: Inside the Digital Underground and the Battle for Our Connected World by Marc Goodman, Corgi; Latest Edition edition (1 March 2016)
- Threat Modeling: Designing for Security (MISL-WILEY) by Adam Shostack, Wiley, 2014
- Cyber War: The Next Threat to National Security and What to Do About It by Richard A. Clarke, Robert Knake, Ecco; Reprint edition (10 April 2012)
- Cyber Terrorism and Information Warfare by M. N. Sirohi, Alpha Editions; 1 edition (22 May 2015)
- Windows Malware Analysis Essentials by Victor Marak, Packt Publishing Limited (31 August 2015)
- Cuckoo Malware Analysis by Digit Oktavianto, Iqbal Muhardianto, Packt Publishing Limited (20 September 2013)
- Tools and Techniques for Fighting Malicious Code: Malware Analyst's Cookbook by Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard, Wiley (2010)
- Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
- Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008.

Reference Books:

- Advanced Persistent Threat: Understanding the Danger and How to Protect Your Organization 1st , Kindle Edition by Eric Cole, Syngress; 1 edition (31 December 2012)

- Advanced Persistent Threat Hacking: The Art and Science of Hacking Any Organization by Tyler Wrightson, McGraw-Hill Education (16 September 2014)

- Darkweb Cyber Threat Intelligence Mining by John Robertson, Ahmad Diab, Ericsson Marin, Eric Nunes, Cambridge University Press; 1 edition (4 April 2017)

- The Evolution of Cyber War: International Norms for Emerging-Technology Weapons by Brian Mazanec, Potomac Books Inc (1 November 2015)

- Practical Malware Analysis – The Hands–On Guide to Dissecting Malicious Software by Michael Sikorski, Andrew Honig, No Starch Press; 1 edition (22 February 2013)

SYLLABI

FOR

CHOICE BASED CORE COURSES

SEMESTER: 6
CHOICE BASED CORE COURSE
BC6C21AB23 - VIRTUALIZATION AND CLOUD SECURITY

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context

This course gives basic knowledge about the Virtualization & Cloud Computing Concepts. It discusses different types of cloud, deployment models, and its various concepts. It discusses the Virtualization security concerns like Hypervisor security, Platform security, security communication, security between guest instance & hosts, guests. The course also concentrates on Cloud Security like Complete Certificate of Cloud Security Knowledge (CCSK). It also deals with the cloud Trust protocols and transparency with their concepts, security, privacy and compliance aspects of cloud. The course finally tries to give out the cloud control matrix and top cloud threats.

The course enables learners with planning and designing skills along with technical skills.

Course Outcomes:

CO1: Describe the basic concepts, threats, vulnerabilities and its security in Cloud Computing. (Understand)

CO2: Discuss about the basic Concepts and security concerns in the Virtualization environment. (Understand)

CO3: Explain Cloud Trust protocol and transparency. (Understand)

CO4: Illustrate Cloud Control Matrix, Trusted Cloud Initiative architecture and reference model. (Understand)

Content.

Module I:(12hrs.)

Introduction to Cloud: Cloud computing concepts, Private cloud Vs Public cloud, IAAS, PAAS & SAAS concepts.

Module II: (13 hrs.)

Introduction to Virtualization: Virtualization concepts, Virtualization security concerns,

Hypervisor Security, Host/Platform Security, Security communications, Security between Guest instances, Security between Hosts and Guests

Module III: (16 hrs.)

Cloud Security: Cloud Security vulnerabilities and mitigating controls, Cloud Trust Protocol, Cloud Controls Matrix. Complete Certificate of Cloud Security Knowledge (CCSK)

Module IV: (16 hrs.)

Cloud Trust Protocol & Transparency: Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Concepts, Security, Privacy & Compliance aspects of cloud

Module V: (15 hrs.)

Cloud Controls Matrix &Top Cloud Threats: Introduction to Cloud Controls Matrix & Top Cloud Threats, Cloud Controls Matrix, Trusted Cloud Initiative architecture and reference model, requirements of Security as a Service model and Top Security threats to the cloud model

Text Books:

- Virtualization Security: Protecting Virtualized Environments by Dave Shackleford, Sybex (4 December 2012)
- OpenStack Cloud Security by Fabio Alessandro Locati, Packt Publishing Limited (28 July 2015)
- Cloud Security – A comprehensive Guide to Secure Cloud Computing by Ronald L.Krutz and Russel Dean Vines, Wiley, 2010
- Cloud Security and Privacy by Mather Tim, Shroff Publishers & Distributers Private Limited - Mumbai; First edition (2009)

Reference Books:

- Securing the Cloud: Cloud Computer Security Techniques and Tactics by Vic (J.R.) Winkler, Syngress (1 June 2011)
- Practical Cloud Security: A Cross-Industry View by Melvin B. Greer Jr., Kevin L.Jackson CRC Press; 1 edition (2 August 2016)
- CCSP (ISC)2 Certified Cloud Security Professional Official Study Guide 1st ,Kindle Edition by Ben Malisow (Author)

SEMESTER: 6

CHOICE BASED CORE COURSE

BC6C21BB23 - CLOUD WEB SERVICES

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course covers the Amazon Web Service in detail about the networking, storage and security aspect of the most popular Product.

The course enables learners with planning and designing skills along with technical skills.

Course Outcomes:

CO1: Discuss the concepts of AWS and its various services. (Understand level)

CO2: Observe the Security principles in AWS. (Understand level)

CO3: Explain the various storage and network services in AWS. (Understand level)

CO4: Describe the benefits and challenges of Cloud Applications. (Understand level)

Content:

Module I: (13 hrs.)

Introduction to AWS: Definition of Cloud Computing, IAAS PAAS & SAAS, Private & Public Cloud, AWS Business hierarchy, The AWS Infrastructure, AWS Strategy, AWS Ecosystem, AWS Benefits, AWS Competitors.AWS Management Console: Setting up AWS Account, Accessing AWS Services, S3 Bucket, Case Studies.

Module II: (15 hrs.)

AWS Management Console and Security: AWS Management Console: Setting up AWS Account, Accessing AWS Services, S3 Bucket, Case Studies. Boundaries of Cloud, Security, AWS Security Groups, Security groups for Application Partitioning – Concept, Amazon Virtual Private Cloud.

Module III: (15 hrs.)

AWS Storage, Elasticity and AWS Networking: Amazon Storage, S3 Storage Basics, Managing Voluminous Information with EBS, Glacier Storage Service, AWS Networking: Networking Basics, VLAN Basics, Basics of AWS VLANs, AWS Network IP Addressing and Mapping. Case Studies.

Module IV: (16 hrs.)

AWS Services: Cloud Front, Relational Database Service, AWS Service Integration, AWS Platform Services: Cloud Search, Simple Queue Service, Simple Notification Service, Simple Email Services, Simple Workflow Service, AWS Management Services: Managing AWS Applications, Monitoring with Cloud watch, Auto-Scaling in AWS, AWS Cloud Formation, Case Studies

Module V: (13 hrs.)

AWS and Applications on Cloud & AWS Costs: Salient Features of AWS, Cloud Application Designing Principles, AWS Costing, Advantages of Cost Utilization Tracking, working Principles, Managing AWS Costs, Case Studies.

Text Books
- Cloud Computing: Principles and Paradigms,Rajkumar Buyya, James Broberg, Andrzej M. Goscinski,, John Wiley and Sons Publications, 2011
- Amazon Web Services for Dummies, Bernald Golden, John Wiley & Sons, 2013 Reference Book
- Brief Guide to Cloud Computing, Christopher Barnett, Constable & Robinson Limited, 2010

SEMESTER: 6

CHOICE BASED CORE COURSE

BC6C21CB23 - FUNDAMENTALS OF DATACENTER

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

 Course Overview and Context:

This course is designed to deliver the relevant knowledge about data centers including its goals, types, requirements and considerations, design etc. Course introduces the server farm concepts and network topology layers of data centers. Also discusses disaster recovery and business continuity management with respect to data centers.

The course enables learners with planning and designing skills along with technical skills.

Course Outcomes:

CO1: Describe data center concept, goals and infrastructure facilities. (Understand)

CO2: Identify the prerequisites and considerations in data center design. (Understand)

CO3: Explain data center topology and distinguish various topology layers. (Understand)

CO4: Discuss business continuity and disaster recovery concepts and techniques. (Understand)

Content:

Module I: (15 hrs.)

Overview of Data Centers: Data Centers Defined, Data Center Goals, Data Center Facilities, Roles of Data Centers in the Enterprise, Roles of Data Centers in the Service Provider Environment, Application Architecture Models. The Client/Server Model and Its Evolution, The n-Tier Model, Multitier Architecture Application Environment, Data Center Architecture.

Module II: (15 hrs.)

Data Center Requirements: Data Center Prerequisites, Required Physical Area for Equipment and Unoccupied Space, Required Power to Run All the Devices, Required Cooling and HVAC, Required Weight, Required Network Bandwidth, Budget Constraints, Selecting a Geographic Location, Safe from Natural Hazards, Safe from Man-Made Disasters, Availability of Local Technical Talent,

Abundant and Inexpensive Utilities Such as Power and Water, Selecting an Existing Building (Retrofitting), tier standard.**Module III:** (12 hrs.)

Data Center Design: Characteristics of an Outstanding Design, Guidelines for Planning a Data Center, Data Center Structures, No-Raised or Raised Floor, Aisles, Ramp, Compulsory Local Building Codes, Raised Floor Design and Deployment, Plenum, Floor Tiles, Equipment Weight and Tile Strength, Electrical Wireways, Cable Trays, Design and Plan against Vandalism.

Module IV: (16 hrs.)

Introduction to Server Farms: Types of server farms and data centre, internet server farm, intranet server farm, extranet server farm , internet data center, corporate data center, software defined data center, data center topologies, Aggregation Layer, Access Layer, Front-End Segment, Application Segment, Back-End Segment, Storage Layer, Data Center Transport Layer, Data Center Services, IP Infrastructure Services, Application Services, Security Services, Storage Services.

Module V: (14 hrs.)

Business Continuity and Disaster Recovery fundamentals: Business continuance infrastructure services, the need for redundancy,, Information availability , BC terminology , BC planning life cycle , BC technology solutions , backup and recovery considerations , backup technologies , Uses of local replicas , Local replication technologies , Restore and restart considerations , Modes of remote replications, remote replication technologies .

Text Book:

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference Books:

- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011

  Windows Azure Step By step by Roberto Brunetti

SEMESTER: 6

CHOICE BASED CORE COURSE

BC6C21DB23- FUNDAMENTALS OF ITIL

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

In this course students will be provided with the details of the Service lifecycle and its components.

The course enables learners with technical as well as planning and designing skills.

Course Outcomes:

CO1: Describe the basic concepts of ITIL and its service strategy. (Understand)

CO2: Discover Service Design, Service Transition and management processes of ITIL. (Understand)

CO3: Discuss service operation of ITIL and the processes involved in it. (Understand)

CO4: Explain Continual Service Improvement and the principles and processes involved in it. (Understand)

Content:

Module I: (14 hrs.)

ITIL Overview and Service Strategy: ITIL History, Components of the ITIL Library, IT Service Management, Organizing for IT Service Management, Technology and Architecture, Overview of HPSM and OTRS as service management tool, Service Strategy: Service Strategy Lifecycle Stage, Service Portfolio Management, the Demand Management Process, the IT Financial Management Process, Introduction to ISO 20000 Standards.

Module II: (16 hrs.)

Service Design: Service Design Lifecycle Stage, The Service Catalog Management Process, The Service Level Management Process, The Availability Management Process, The Capacity Management Process, The Information Security, Management Process, The IT Service Continuity, Management Process, The Supplier Management Process.

Module III: (16 hrs.)

Service Transition: Service Transition Lifecycle Stage, the Change Management Process, the Release and Deployment Management Process, the Service Asset and Configuration Management Process, Knowledge Management.

Module IV: (12 hrs.)

Service Operation, Continual Service Improvement: Service Operation Functions : Service Operation Lifecycle Stage, The Service Desk Function, The Technical Management Function, The Application Management Function, The IT Operations Management Function Service Operation Processes :The Event Management Process, The Incident Management Process, The Request Fulfillment Process, The Access Management Process, The Problem Management Process.

Module V: (14 hrs.)

Continual Service Improvement: Continual Service Improvement principles - CSI and organizational change, Ownership, Role definitions , External and internal drivers , Service Level Management , The Deming Cycle, Service measurement ,Knowledge Management, Benchmarks , Governance ,Frameworks, models, standards and quality systems Continual Service Improvement processes : 7step improvement process, Service reporting, Service management, return on in investment for CSI, business questions for CSI, Service level management.

Text Books:

- Introduction to ITIL, Jan van Bon Stationery Office Books, The Stationery Office, 2010
- HP operation Manual from HP, 2010 A Guide to Service Desk Concepts Donna Knapp From Cengage Learning, 2010

Reference Books:

- The Shortcut Guide to Virtualization and Service Automation, Greg Shield Real time Publishers, 2008
- Service automation and dynamic provisioning techniques in IP/MPLS environments Christian Jacquenet, Gilles Bourdon, Mohamed Boucadair John Wiley and Sons, 2008

SYLLABI

FOR

COMPLEMENTARY COURSES

SEMESTER: 1
COMPLEMENTARY COURSE

BC1B01B23 - COMPUTER FUNDAMENTALS AND ORGANIZATION

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The knowledge of how a computer works is very important for any IT learner. The functional knowledge of a computer's working and its main building components are paramount. The computers of today may come with a variety of features, but the basic working principles will remain the same. In this course, the learners will explore the fundamentals of organization of a computer and the principles and building Modules. This will build a basic understanding for learning core topics like basic computer organization and working, networking, operating systems, etc. Also, the learners will be introduced to digital fundamentals including boolean algebra and gate functions, number systems etc.

This course aims at enabling learners with analytical and technical skills which in turn help them in decision making and problem solving.

Course Outcomes:

CO1: Explain the basic organization and operational concepts of computers. (Understand)

CO2: Discuss the addressing modes and memory organization. (Understand)

CO3: Identify the types of operating systems and computer networks. (Understand)

CO4: Recognize number systems and their conversions. (Understand)

CO5: Describe concepts of boolean algebra and gate functions. (Understand)

Content:

Module 1 (14 hours)

Computer Organisation:

Functional units of a computer system, types of computers, Generations of computers, Computer Software and Hardware, Input output devices.

Operational concepts, Instruction codes, Computer Registers, Computer Instructions, Memory locations and addresses, Instruction cycle, Timing and control, Bus organization.

Module 2 (16 hours)

Central Processing Unit:

General Register Organization, Stack Organization, Addressing modes, Instruction Classification, Program control.

Memory Organization

Memory Hierarchy, Main Memory, Organization of RAM, SRAM, DRAM, Read Only Memory-ROM-PROM,EROM,EEPROM, Auxiliary memory, Cache memory, Virtual Memory, Memory mapping Techniques.

Module 3 (12 hours)

Introduction to Operating Systems and Networking: Definition of an Operating System – Different types of PC Operating Systems. Computer Networks- categories of networks - LAN, WAN,MAN. The Internet - Working of Internet - Major Features of Internet.

Module 4 (15 hours)

Number Systems: Base or radix, Positional number system, Popular number systems (Decimal, Binary,Octal and Hexadecimal), Conversion-From one number system to another, Concept of binary addition and subtraction, Complements in binary number systems,1s Complement, 2s Complement and their applications.

Module 5 (15 hours)

Boolean Algebra and Gate Networks: Logic gates- AND, OR, NOT, NAND and NOR Truth tables and graphical representation, Basic laws of Boolean Algebra, Simplification of Expressions, De Morgans theorems, Dual expressions, Canonical expressions, Min terms and Max terms, SOP and POS expressions, Simplification of expression using K-MAP (up to 4 variables).

Text Books:

- Carl Hamacher -Computer Organization, Fifth Edition, Tata McGraw Hill.
- M.Morris Mano-Computer Systems Architecture, Third Edition, Pearson Education
- M Morris Mano-Digital Logic and Computer design, Fourth Edition, Prentice Hall.

Reference Books:

- Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill

- P K Sinha & Priti Sinha - Computer Fundamentals , Fourth Edition, BPB Publications.

- John P Hayes -Computer Architecture & Organization–Mc Graw Hill

- William Stallings-Computer Organization and Architecture, Seventh Edition, Pearson Education

- Thomas C Bartee- Digital computer Fundamentals, Sixth Edition, TATA McGraw Hill Edition

- Thomas L Floyd- Digital Fundamentals, Ninth edition,PEARSON Prentice Hall.

MODEL QUESTION PAPER
BCA DEGREE (C.B.C.S.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - COMPLEMENTARY COURSE FOR
BCA(CLOUD TECHNOGY AND INFORMATION SECURITY MANAGEMENT)
BC1B01B23: COMPUTER FUNDAMENTALS AND ORGANIZATION

Time : 3 hours   Maximum marks: 80
Part A

(Answer any ten questions. Each question carries 2 marks)

Qn.No.	Questions	CO	Level of questions
1.	Define Computer.	1	R
2.	Expand and describe ALU.	1	U
3.	Discuss on virtual memory.	2	U
4.	Describe cache memory.	2	U
5.	Distinguish between SRAM and DRAM.	2	U
6.	Enumerate features of OS.	3	U
7.	Explain Point-to-Point transmission.	3	U

8.	Describe octal number system.	4	U
9.	Define radix of a number system	4	U
10.	Convert the binary whole number 110010 to its corresponding decimal number.	4	Ap
11.	Distinguish between SOP and POS.	5	U
12.	Describe k-map.	5	U

(10 x 2 = 20 marks)

Part B

(Answer any six questions. Each question carries 5 marks)

Qn.No.	Questions	CO	Level of questions
13.	Explain the overview of a computer system.	1	U
14.	Explain in detail the instruction steps to execute the CPU cycle.	1	U
15.	Write notes on secondary storage devices.	2	U
16.	Explain various addressing modes.	2	U
17.	Discuss on system software.	3	U
18.	Distinguish various number systems.	4	U
19.	Explain conversion from decimal to binary, octal and hexadecimal with example.	4	U
20.	State and prove De Morgan's theorem.	5	U
21.	Explain NOR and NAND gates.	5	U

(6 x 5 = 30 marks)

Part C

(Answer any two questions. Each question carries 15 marks.)

Qn.No.	Questions	CO	Level of questions

22.	Discuss the generations of computers with suitable examples.	1	U
23.	Explain the memory Hierarchy.	2	U
24.	Explain different types of Networks along with their advantages and disadvantages.	3	U
25.	Explain the basic gates with truth table.	5	U

(2 x 15 = 30 marks)

CO: Course Outcomes
Level: R – Remember, U – Understand, Ap- Apply, An- Analyze, E- Evaluate, C- Create

SEMESTER: 1

COMPLEMENTARY COURSE

ST1B01B23 - DESCRIPTIVE STATISTICS

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

The basic concepts of Statistics are discussed and the techniques to expose the students to many Statistical ideas and rules that underlie Statistical reasoning are outline.

This course introduces the basic concepts of Statistics, different steps in a Statistical analysisand the important characteristics of a Statistical data.

Course Outcomes:

CO1: Describe the fundamentals of Statistical analysis.(Understand)

CO2: Explain numerical facts through tables and graphs. (Apply)

CO3: Illustrate the characteristics of averages and dispersion. (Analyze)

CO4: Explain moments and infer about skewness and kurtosis regarding a given data. (Analyze)

CO5: Interpret Index numbers. (Apply)

Content:

Module I   (20 hours)

Introduction to Statistics, Population and Sample, Collection of Data, Various methods of data collection, Census and Sampling. Methods of Sampling – Simple Random Sampling– stratified sampling– systematic sampling (Method only), Types of data – quantitative, qualitative, Classification and Tabulation, Frequency Table, Diagrammatic representation – Bar diagram, pie diagram; pictogram and cartogram.

Module II   (20 hours)

Measures of Central Tendency – Mean; Median; Mode; Geometric Mean; Harmonic Mean and Properties, Partition values- Quartiles, Deciles, Percentiles, Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Box Plot, Mean Deviation, Standard Deviation, Coefficient of Variation.

Graphical representation – histogram, frequency polygon, frequency curve, ogives and stem and leaf chart.

Module III   (16 hours)

Raw Moments, Central Moments, Inter Relationships (First Four Moments), Skewness – Measures – Pearson's, Bowley's and Moment Measure; Kurtosis- Measures of Kurtosis – Moment Measure, Measure based on partition values.

Module IV   (16 hours)

Index Numbers – definition, limitations, uses, Simple Index Numbers; Weighted Index Numbers – Laspeyer's, Paasche's and Fisher's Index Numbers, Test of Index Numbers, Construction of Index Numbers, Cost of Living Index Numbers – Family Budget Method, Aggregate Expenditure Method.

Text Books

- • S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).

- • S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

- • B.L. Agarwal: Basic Statistics, New Age International (P) Ltd.

- • Parimal Mukhopadhya: Mathematical Statistics, New Central Book Agency (P) Ltd, Calcutta

- • Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta.

MODEL QUESTION PAPER
B.Sc. DEGREE (C.B.C.S.S) EXAMINATION, NOVEMBER 2023
SEMESTER I -COMPLEMENTARY COURSE FOR
BCA(CLOUD TECHNOLOGY AND INFORMATION SECURITY MANGEMENT)
ST1B01B23: DESCRIPTIVE STATISTICS

Time : 3 hours   Maximum marks: 80

Use of Scientific calculators and Statistical tables are permitted.

Part A (Short Answer Questions)

Answer ***any ten*** questions. Each question carries 2 marks.

Q.No.	Question	CO	Level
1	Define Simple random sampling	1	R
2	Give the sources of secondary data.	1	R
3	Distinguish between Census and sample survey.	1	U
4	Define Mean deviation.	3	R
5	Establish that the sum of deviations of observations from its A.M is zero.	3	Ap
6	Find the standard deviation of the numbers 7,9,16,24,26	3	E
7	What is the difference between a Bar diagram and a Histogram?	2	U
8	The first two moments of a distribution about X = 4 are 1 and 4. Find the mean and variance.	4	E
9	Explain 'Skewness' and 'Kurtosis'.	4	U
10	Explain commodity reversal test?	5	U
11	If $\sum P_k = 360$, $\sum P_o = 300$ find the simple aggregate Index number.	5	E
12	Examine whether Laspeyer's Index number satisfies Factor reversal test.	5	Ap

(10x2 = 20 marks)

Part B (Short Essay Questions)

Answer any ***six*** questions. Each question carries 5 marks.

Q.No.	Question	CO	Level
13	Draw an ogive for the following data and hence find Median. C. I: 25-40 40-55 55-70 70-85 85-100 F: 7 13 21 12 9	2	An
14	What are the parts of a table?	1	R
15	Explain Box Plot.	2	U
16	Find Mean, Median and using the Empirical relation find Mode. X: 4 8 12 16 20 24 F: 2 7 15 11 9 6	3	E
17	Establish the effect of change of origin and scale on standard deviation.	3	Ap

18	Establish the relation between Raw and Central moments.	4	Ap
19	For a distribution the Mean is 10, Variance is 16, $\beta_1 = 1$, $\beta_2 = 4$, Obtain the first four moments about 0.	4	E
20	The first four moments about 2 of a distribution are 1, 2.5, 5.5, and 16. Comment on its skewness and kurtosis.	4	E
21	Explain the various steps involved in the Construction of an Index Number.	5	U

(6x5 = 30 marks)

Part C (Essay Questions)

Answer any *two* questions. Each question carries 15 marks.

Q.No.	Question	CO	Level
22	(a) What is an Ogive? Explain how the Ogive can be used to find out the Median and Quartiles? (b) Explain Stem and Leaf Chart.	2	Ap
23	An Analysis of monthly wages paid to workers in two firms A and B belonging to the same Industry, gives the following results Firm A Firm B No. Of wage earners 550 650 Average monthly wages 50 45 Variance of wages 90 120 (a) Which firm A or B pays out larger amount as monthly wages? (b)In which firm A or B is there greater variability in Individual wages? (c)What are the measures of average and Standard deviation of monthly wages of all the workers in the two firms taken together ?	3	An
24	(a) Show that $\beta_2 > 1$ for a Discrete distribution. (b) Calculate Pearson's Coefficient of Skewness for the following distribution Variable 0-5 5-10 10-15 15 – 20 20 – 25 25 -30 30-35 Frequency 3 5 9 15 21 10 7	4	E

25						5	E

Commodity	Price(Rs per unit)		Quantity (Kg)	
	Base year	Current year	Base year	Current year
A	20	30	12	18
B	30	42	10	14
C	22	34	6	10
D	18	28	8	12

Calculate Laspeyer's, Paasche's and hence Fisher's Index numbers for the above data.

(2x15 = 30 marks)

CO: Course Outcomes
Level: R – Remember, U – Understand, Ap- Apply, An- Analyze, E- Evaluate, C- Create

SEMESTER: 2
COMPLEMENTARY COURSE

BC2B02B23 - OPERATING SYSTEM

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

An operating system (OS) is a collection of software that manages computer hardware resources. They will be providing common services for computer programs. The operating system is the vital component of the system software in a computer system. it is the intermediary between users and computer hardware. It controls the allocation of resources and services like memory, processor, device, data, etc. Operating systems are now available not only for computers and laptops, but also for small handheld devices like Smart phones, tablets, etc. Operating system examples are – Windows XP, 7, 8, server; LINUX, UNIX, Android, iOS, etc.This course focuses on the basic concepts of operating system, the internal working, etc. This course deals with memory management, disk management, file systems, deadlock avoidance and prevention, etc.

This course enhances the technical ability of students.

Course Outcomes:

CO1: Explain the Operating System, objectives, functions, components and services. (understand)

CO2: Illustrate the concept of Process, its scheduling and CPU scheduling. (apply)

CO3: Discuss the concept of Process Synchronization, thread handling and deadlocks (understand)

CO4: Illustrate the Physical and Virtual Memory management techniques along with storage management using files and Disk management**. (**apply)

CO5: Choose appropriate security techniques for attaining a highly secure system. (apply level)

Content:

Module I: (15 hrs.)

Introduction to Operating System: Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

Module II: (15 hrs.)

Process Management: Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client- server systems.

Threads: Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions

Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Module III: (16 hrs.)

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging.

Virtual Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

Module IV: (10 hrs.)

Storage Management: **File-System Interface:** File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics

File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery

Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

Module V: (15 hrs.)

Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection Security: Security Problem, User Authentication, One – Time Password, Program Threats,System Threats, Cryptography, Computer – Security Classifications.

Text books

- Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
- Silberschatz / Galvin / Gagne, Operating System,6th Edition,WSE (WILEY Publication)
- Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall

Reference Books

- Garry Nutt, "Operating Systems – A Modern perspective ", Third Edition, Pearson Education
- Bach, M.J., "Design of UNIX Operating System", Prentice Hall
- Charles Crowley, "Operating systems – A Design Oriented Approach", Tata McGrawhill, 1997
- Michel Palmer "Guide o Operating Systems", Vikas Thomson Learning Publishing, NewDelhi
- Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
- William Stallings, Operating System, 4th Edition, Pearson Education.
- H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
- Nutt: Operating Systems, 3/e Pearson Education 2004
- D.M.Dhamdhere, "Operating Systems", 2nd Edition, Tata McGraw-Hill

SEMESTER: 2
COMPLEMENTARY COURSE

MT2B04B23 - FUNDAMENTALS OF MATHEMATICS

Credits: 4

Hours per week: 4   **Total Lecture Hours: 72**

Course Overview and Context:

This course promotes the methods and benefits of mathematical thoughts and logical understandings. So as to use the concepts in computer applications.

This course mainly focuses on study of first order differential equation, partial differential equation, Laplace transforms , limit of functions, matrices etc. The learners will obtain problem solving skills and logical perspectives through this course

Course Outcomes:

CO1: Solve the system of linear equations using matrices. (Apply level)

CO2: Analyze the extreme values of a function using derivatives. (Analyze level)

CO3: Solve first order partial differential equations using Lagrange's method. (Apply level)

CO4: Compute the Laplace transform and inverse Laplace transform of a function and find the solution of differential equations. (Apply level)

Content:

MODULE I: (17 hrs.)

Matrices: A quick review of the fundamental concepts, Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of a Non-Singular Matrix, Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogeneous Equations, Characteristic equation of a matrix.. (proof of all the theorems are to be excluded.)

Text 1. Chapter 4, section 4.1-4.10, chapter 6 , section 6.1,6.2,6.6, chapter 11 Section 11.1

MODULE II:(20hrs)

Differential Calculus: A quick review of limits of function, rules for finding limits, extensions of limit concepts, derivative of a function, differentiation rules, chain rule, rate of change and simple applications of the rules. Extreme values of a function Rolle's Theorem, Mean Value Theorem. (Excluding proofs of theorems)

Text 2 , Sections 2.1 – 2.4, 3.1 – 3.6, 4.1 - 4.3

MODULE III: (15 hrs.)

Partial Differential Equations Introduction, formulation of Partial Differential Equation by elimination of arbitrary constants and by elimination of arbitrary function. Solution of first order equations using Lagrange's method.

Text 3 Chapter 1, section 1 and 3 & Chapter 2 Section 1, 2 and 4

MODULE IV: (20 hrs.)

Laplace Transforms 125 Definitions- transforms of elementary functions, properties of Laplace transforms, inverse transforms- convolution theorem (no proof).

Text 2 (Sections 6.1, 6.2 and 6.5)

Text book:

- Shanti Narayan , Dr P.K Mittal , A text book of Matrices, S Chand
- George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.
- Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)
- Erwin Kreyszig : Advanced Engineering Mathematics, Ninth Edition, Wiley, India.

References:

- S.K . Stein – Calculus and analytic Geometry , (McGraw Hill)
- Zubair Khan, Shadab Ahmad Khan - Mathematics– 1 and Mathematics – II (Ane Books)
- Shanti Narayan - Matrices (S. Chand & Company)
- N.P.Bali, Dr.N.Ch.Narayana Iyengar-Engineering mathematics – L
- Matrices, Frank Ayres JR Schaum's Outline Series, TMH Edition
- Thomas and Finney - Calculus and analytical geometry (Addison-Wesley)
- Dr. B. S. Grewal – Higher Engineering Mathematics

SEMESTER: 3
COMPLEMENTARY COURSE

BC3B03B23 - COMPUTER NETWORKS

Credits: 4

Hours per week:4   **Total Lecture Hours: 72**

Course Overview and Context:

It is important for networking professionals to have a sound grounding in the basics of networking and with the networking technology being developed thick and fast, the professionals need to be updated on them at all times. The course provides a background to the basics of networking and its underlying principles. The course is structured in such a way that the learners could explore the fundamentals of networking, the principle and purpose behind layered models, devices used in networks and their wireless connectivity and the ways to troubleshoot network related issues. The course also underpins the principles of networking and enables the learners to work towards taking up vendor certifications in the networking domain.

This course aims at enabling learners with planning, designing, management and technical skills which in turn help them in decision making and problem solving.

Course Outcomes:

CO1: Discover the fundamentals of networks, its working and Network security. (Understand level)

CO2: Discuss about networking devices, wired and wireless technologies. (Understand level)

CO3: Explain the details and functionality of layered network architecture. (Understand level)

CO4: Examine different protocols, standards and the models associated with networking technology and their troubleshooting mechanisms. (Apply level)

Content:

Module I: (10 hrs)

Networking Fundamentals: Basics of Networking, Networking Terms- Host, Workstations, Server, Client, Node, Advantages of Networking, Types of Networks, Network Topologies, Types of Transmission Media- Guided and Unguided, Communication Modes. Data communication

protocols and standards, Network models - OSI model-layers and their functions, TCP/IP protocol suite.

Module II: (12 hrs.)

Data link layer: Error Detection and Correction, Framing, flow and error control, Protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels (Stop and Wait and Piggy Backing), PPP.

Module III: (12 hrs.)

Multiple Access Protocols. Random Access-ALOHA, CSMA. Connecting Devices- Repeater, Modem, Hub, Switch, Bridge, Router, Gateway. Wired LANs-IEEE standards, wireless LANs-Bluetooth, Cellular Telephony, Satellite Networks, SONET.

Module IV: (17 hrs.)

Network layer and Transport layer: Logical addressing – IPv4 addressing, IPv4 address Classes, Subnet Mask, Public & Private IP Address and IPV6 addressing, Address mapping- ICMP, IGMP.

Connectionless and Connection-Oriented Services: Transport layer services, UDP and TCP. Congestion Control, Quality of Service. Introduction to Routing and Switching concepts.

Module V: (13 hrs.)

Application Layer: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP. Virtual Private Networking, Network security: Common Threats- Firewalls (advantages and disadvantages), Digital Signature, Troubleshooting the network.

Text Books:

- Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH,2006.

- Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education

 Reference Books
- CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011

- CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson,

2013

- Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
- CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010