ST. TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM

Affiliated to Mahatma Gandhi University, Kottayam

CURRICULUM AND SYLLABI FOR THE PROGRAMME

B.Sc. COMPUTER APPLICATIONS (TRIPLE MAIN)

Programme Code : BCA

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

St. Teresa's College (Autonomous)

Department of Computer Applications

Board of Studies in Computer Applications

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
3	Faculty Member	Mrs.Sheeba Emmanuel	Assistant Professor	Department of Computer Applications, St.Teresa's College (Autonomous), Ernakulam
4	Faculty Member	Mrs.Dhanya R	Assistant Professor	Department of Computer Applications, St.Teresa's College (Autonomous), Ernakulam
5	Faculty Member	Ms. Remya C J	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous), Ernakulam
6	Faculty Member	Ms. Mekha Jose	Assistant Professor	Department of Computer Applications St Teresa's College, (Autonomous), Ernakulam
7	Faculty Member	Ms. Archana Menon P	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous), Ernakulam
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
14	Faculty Member	Ms. Anjaly Muralidharan	Assistant Professor	Department of Computer Applications St Teresa's College (Autonomous), Ernakulam
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 mould 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.

Rev. Dr. Sr. Vinitha (Dr. Celine E)
Manager

FOREWORD

The most significant characteristic of an autonomous college is its commitment to curriculum 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 is 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 endeavor.

Prof. 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, Smt. Betty Joseph, Dean of Self Financing Programmes Dr.Beena Job, the IQAC team headed by Dr. Kala M.S 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 Computer Applications, Mathematics and Statistics. 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 for all our endeavors.

Ms.Raji S Pillai

Head of the Department

Contents

PREAMBLE

Bachelor in Computer Applications (Triple Main) programme at Department of Computer Applications, St.Teresa's College was following the syllabus of Mahatma Gandhi University, Kottayam from the academic year 1995-1996. And a restructured syllabus 2015 Admission onwards. after it was granted academic autonomy in the year 2014, and hence has the privilege of restructuring the syllabus. The syllabus was again restructured in the year 2018 taking into consideration, the suggestions from the stakeholders. Keeping an eye on the industry and to modernize the curriculum, the Board of Studies members of the Department of Computer Applications, St.Teresa's College, has initiated a restructuring of the syllabus for Bachelor in Computer Applications (Triple Main) programme for 2023 Admissions.

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 Computer Applications, Mathematics, and Statistics.

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), the 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.

BCA - B. Sc. COMPUTER APPLICATIONS (TRIPLE MAIN)

PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of B.Sc. Computer Applications (Triple Main) Programme, the students should be able to demonstrate the programme specific outcomes listed below: -

PSO1: Associate the basic concepts of mathematical structures, and statistical principles with computer science. (Understand)

PSO2: Articulate Computational principles, fostering future learning to conform to technological advancements. (Apply)

PSO3: Analyze real world problems and integrate mathematical and statistical concepts to design computer-based solutions. (Analyze)

PSO4: Develop holistic professional growth with effective communication skills and economic consciousness to society. (Apply)

PSO5: Formulate innovative solutions to socially committed, industry relevant and strategic research problems. (Create)

ELIGIBILITY

Candidates should have passed the Plus Two / Equivalent Examination in Science stream with **Mathematics** as one of the optional subjects.

PROGRAMME DESIGN

The U.G. Programme B.Sc. Computer Applications [Triple Main] must include

(a) Common courses,

(b) Core courses,

(c) Choice based courses

(d) Open courses and

(e) Project work and Course viva - voce.

No course shall carry more than 4 credits. The student shall select any one open course in Semester V offered by any department other than their parent department including the physical education department, depending on the availability of infrastructure facilities, in the institution.

The B.Sc. Computer Applications (Triple Main) includes,

Common courses

Core courses

a. Choice Based Core Course
b. Project
c. Open Course

Common courses- The common course shall be provided for first two semesters. With four credits each.

Core courses - The programme offers core courses from three main streams, Computer Applications, Mathematics and Statistics. Credits are distributed in the ratio 3:2:2

Choice Based Core Course

A Choice Based Core Course is provided in the sixth semester. The student has to select a course from a provided list. Departments have the freedom to change current papers /choose other papers if found relevant. But changes should not affect number of teaching hours of each department.

Project

- All students have to do a project in the **Final** year.
- This project can be done individually or as a group of maximum 3 students. The projects are to be identified during the 5th semester of the programme with the help of the supervising teacher. The project evaluation will be carried out in the sixth semester.

Open course

All students are expected to do the open course in fifth semester. The students can opt from the courses offered by any discipline other than their own core discipline

PROGRAMME STRUCTURE

MODEL III B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN]

A.	Programme Duration	6 Semesters
B.	Total Credits required for successful completion of the Programme	120
C.	Credits required from Common Course I	8
D.	Credits required from Core course including Project	109
E.	Credits required from Open Course	3

COURSES

The programme (Model III) consists of Common courses with 8 credits, Core courses and Choice based course together 109 credits and Open course with 3 credits.

SCHEMES OF COURSES

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

Model- III	
Courses	**Number**
Common Courses	2
Core Courses (Theory)	25
Project & Course Viva	2
Core practical	5
Open Course	1
Choice based Course	1
Total	36

For MODEL III is given below

Courses	**Credits**
Core Courses	101
Open Course	3
Choice Based Core	4
Project, I.V. & Viva	4
Total	112
Common Courses	8
Total	8
Grand Total	**120**

SCHEME OF DISTRIBUTION OF INSTRUCTIONAL HOURS FOR CORE COURSES

Semester	Model III	
	Theory	**Practical**
First	16	4
Second	16	4
Third	22	3
Fourth	21	4
Fifth	23	2
Sixth	20	5

COURSE CODE FORMAT

The programme is coded according to the following criteria.

1. The first letter plus second letter form the Department which offer the programme ie., **CA** for Computer Applications**, MT** for Mathematics**, ST** for Statistics and **EN** for English
2. One digit to indicate the semester. i.e., **CA1 (Computer Applications, 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.., **CA1C (Computer Applications, 1st semester Core course)** and **PR** for project.
4. Two digits to indicate the course number of that semester. ie.., **CA1C01 (Computer Applications, 1st semester, Core course, course number is 01)**
5. The letter **B** to indicate Bachelors Programme.
6. **CA1C01B** (Computer, 1st semester, Core course, courses number 01, and **B** for Bachelors Programme)
7. **23 to indicate the year of revision.** ie.., **CA1C01B23**

8. The letter **P** denotes practical – it should come after the code letter for the course ie **CP** (core practical-eg. CA2CP01B23
9. Main Project: CA6**PR**B23 and Viva Voce - CA6C**V**B23
10. The letter I denotes internship– It should come after the code letter for the course ie…,CI (Core Internship-eg. CA2CI01B23)

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

B.Sc. COMPUTER APPLICATIONS (TRIPLE MAIN)

Semester	Course Type	Course Code	Course Title	Hrs/ Week	Credits	Max. Marks	
						ISA	ESA
I	**Common Course I**	EN1A0123	Fine Tune Your English	5	4	20	80
	Core Course (Computer Applications)	CA1C01B23	Computer Fundamentals And Digital Principles	4	3	20	80
	Core Course (Computer Applications)	CA1C02B23	Object Oriented Programming Using C++	4	3	20	80
	Core Course (Computer Applications)	CA1CP01B23	Software Lab -I (Object Oriented Programming Using C++)	4	2	20	80
	Core Course (Mathematics)	MT1C01B23	Discrete Mathematics And Trigonometry	4	3	20	80
	Core Course (Statistics)	ST1C01B23	Descriptive Statistics	4	3	20	80
	TOTAL HOURS & CREDIT			**25**	**18**		

II	**Common Course II**		Issues that matter	5	4	20	80
	Core Course (Computer Applications)	CA2C03B23	Database Management Systems	4	3	20	80
	Core Course (Computer Applications)	CA2C04B23	Data Structures Using C++	4	3	20	80
	Core Course (Computer Applications)	CA2CP02B23	Software Lab II **(**Data Structures Using C++)	4	2	20	80
	Core Course (Mathematics)	MT2C02B23	Number Theory, Cryptography, Laplace Transforms And Conic Sections	4	3	20	80
	Core Course (Statistics)	ST2C02B23	Probability And Random Variables	4	3	20	80
	TOTAL HOURS & CREDIT			**25**	**18**		
III	**Core Course (Computer Applications)**	CA3C05B23	JAVA Programming	4	3	20	80
	Core Course (Computer Applications)	CA3C06B23	Operating Systems	4	4	20	80
	Core Course (Computer Applications)	CA3C07B23	System Analysis And Software Engineering	4	3	20	80

	Core Course (Computer Applications)	CA3CP03B23	Software Lab III (Java Programming)	3	2	20	80
	Core Course (Mathematics)	MT3C03B23	Calculus	5	4	20	80
	Core Course (Statistics)	ST3C03B23	Probability Distributions	5	4	20	80
	TOTAL HOURS & CREDIT			**25**	**20**		
IV	**Core Course (Computer Applications)**	CA4C08B23	Linux Administration	3	3	20	80
	Core Course (Computer Applications)	CA4C09B23	Python Programming	3	3	20	80
	Core Course (Computer Applications)	CA4CP04B23	Software Lab IV (Python Programming)	4	3	20	80
	Core Course (Mathematics)	MT4C04B23	Vector Calculus, Theory Of Equations And Matrices	5	4	20	80
	Core Course (Statistics)	ST4C04B23	Statistical Inference	5	4	20	80
	Core Course (Statistics)	ST4C05B23	Sample Survey And Design Of Experiments	5	4	20	80
	TOTAL HOURS & CREDIT			25	21		
	Core Course	CA5C10B23	Machine Learning	4	4	20	80

	(Computer Applications)						
V	**Core Course (Computer Applications)**	CA5CP05B23	Software Lab V (Machine Learning Algorithms Implementation Using Python)	2	3	20	80
	Core Course (Mathematics)	MT5C06B23	Real Analysis I	5	4	20	80
	Core Course (Mathematics)	MT5C07B23	Differential Equations	5	4	20	80
	Core Course (Statistics)	ST5C06B23	Environmental Studies, Human Rights And Numerical Methods	5	4	20	80
	Open Course		Course Offered By Other Departments	4	3	20	80
	TOTAL HOURS & CREDIT			25	22		
VI	**Core Course (Computer Applications)**	CA6C11B23	Computer Networks And Introduction To Cloud Technology	5	4	20	80
	Choice Based Core Course (Computer Applications)	CA6C12AB23	Soft Computing Techniques	5	4	20	80
		CA6C12BB23	Data Mining			20	80
		CA6C12CB23	Cloud Computing			20	80
		CA6C12DB23	Digital Image Processing			20	80
	Core Course (Mathematics)	MT6C12B23	Linear Algebra	5	4	20	80
	Core Course (Statistics)	ST6C07B23	Optimization Techniques	5	4	20	80

	PROJECT	CA6PRB23	Software Development Lab (Main Project)	5	4	20	80
	COURSE VIVA	CA6CVB23	Course Viva	-	1	-	100
	TOTAL HOURS & CREDIT			25	21		
TOTAL CREDITS					**120**		

COURSES

SCHEME – CORE COURSES

Courses	Credits
Core Courses	101
Choice Based Core	4
Project, I.V. & Viva	4
Total	112

SCHEME - OPEN COURSE

Sl. No.	Semester	Course Code	Course Title
1	V	CA5D01AB23	Computer Fundamentals, Internet & MS Office
2	V	CA5D01BB23	Informatics And Cyber Ethics

SCHEME - CHOICE BASED COURSES

Sl. No.	Semester	Course Code	Course Title
1	VI	CA6C12AB23	Soft Computing Techniques
2	VI	CA6C12BB23	Data Mining
3	VI	CA6C12CB23	Cloud Computing
4	VI	CA6C12DB23	Digital Image Processing

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 END-SEMESTER ASSESSMENT (ESA) AND

IN-SEMESTER ASSESSMENT (ISA)

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

Components of the internal evaluation and their marks are as 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*	5
Test papers (2 x 5)	10
Total	**20**

Assignment

(i) *Assignment: 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

(ii)* 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.

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

FOR PROJECTS / COURSE VIVA-VOCE*:

The project topic shall be chosen from areas of current day interest using latest packages / languages running on appropriate platforms (Except the tools used in software development-I), 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.

Projects which are preferably socially relevant/ industry oriented/ research oriented is to be undertaken by the students.

Scheme of Evaluation for Software Development Lab (MAIN PROJECT) external is as follows:

Division of Marks

Project demonstration and Presentation	-	**40 marks**
Viva related to project	-	**20 marks**
Project report with proper content and binding	-	**20 marks**
Total Marks	-	**80 marks**

Bonafide reports of the project work or Industrial Visit conducted shall be submitted at the time of examination.

IN-SEMESTER EXAMINATION

THEORY COURSES

Two internal test- papers are to be attended in each semester for each paper. The evaluations of all components are to be published and are to be acknowledged by the students. All documents of internal assessments are to be kept in the college for two years and shall be made available for verification by the university. The responsibility of evaluating internal assessment is vested on the teachers who teach the course.

PRACTICAL COURSES

All the four components of the ISA are mandatory.	
Components of Practical ISA	**Marks**
Attendance	5
Lab Involvement	2
2 Practical Test	5+5=10
Record	3
Total	**20**

END-SEMESTER EXAMINATION

THEORY COURSES

The End-Semester examination of all courses shall be conducted by the College on the close of each semester. For reappearance/ improvement, students can appear along with the next batch.

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 short answer 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

PRACTICAL EXAMINATION

An End Semester Practical Examination will be held for all practical courses with a maximum of 80 marks.

GRADES

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 ISA and ESA (for both theory and practical) and aggregate minimum of 35% is required 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 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:

$$CCPA = TCP/TC$$

TCP = Total Credit Point of that programme, TC = Total Credit of that programme

CREDIT POINT AVERAGE (CPA)

CPA of different category of courses viz. Common courses, Complementary courses, Core courses etc. are calculated:

CPA = TCP/TC

TCP = Total Credit Point of a category of course

TC = Total Credit of that category of course

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA.

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 of I, II, III & IV semesters, candidate have to appear along with the next batch.
- There will be supplementary exams for V semester in the respective academic year.
- Notionally registered candidates can also apply for the said supplementary examinations.
- A student who registers her name for the end semester assessment for a semester 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 ISA can re-do the same registering along with the ESA 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

SEMESTER I

CORE COURSE

CA1C01B23 - COMPUTER FUNDAMENTALS AND DIGITAL PRINCIPLES

Credits : 3

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

Course Overview and Context :

Introduction to the basics of digital systems and their design; the analysis of digital circuits using Boolean Algebra and logic reduction; concepts of memory systems and examination of the various designs, flip-flops, registers, counters. This is a core course for the students to gain more insights to the actual working principles of computing systems.

This course enables the students to pursue career in the field of electrical/electronics equipment installer and repairer.

Course Outcomes:

CO1: Differentiate the different types of computers, Operating Systems and basics of Networks and Internet. (Understand)

CO2: Illustrate the conversion between various number systems and the construction of binary code. (Apply)

CO3: Design simplified logical expression for digital circuits (Create)

CO4: Describe the working of combinational and sequential circuits and construct digital circuits of medium complexity (Apply)

Syllabus Content:

Module I **(12 Hrs)**

Introduction: Functional units of a computer system, Different types of computers, Computer Software and Hardware, Types of software-System software and Application program. Characteristics of computers. Input Devices – Keyboard, Mouse, Optical input devices, Output devices – Monitors and Printers, Primary & Secondary Memory

Module II **(15 Hrs)**

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 III **(15 Hrs)**

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, Signed magnitude form, BCD numbers- concept and addition, Parity.

Module IV **(15 Hrs)**

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-Morgan's theorems, Dual expressions, Canonical expressions, Min -terms and Max -terms, SOP and POS expressions, Simplification of expression using K-MAP (up to 4 variables), Representation of simplified expressions using NAND/NOR Gates, Don't care conditions, XOR and its applications, parity generator and checker.

Module V **(15 Hrs)**

Sequential and Combinational Logic. Flip flops- Latch, Clocked, RS, JK, T, D and Master slave, Adders-Half adder, Full adder(need and circuit diagram), Encoders, Decodes, Multiplexers and De-multiplexers (working of each with diagram), Analog to digital and digital to analog converters (Diagram and working principle) , Concept of Registers, Shift Registers, Counters.

Books of study:

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

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

3. M Morris Mano-Digital Logic and Computer design, Fourth Edition, Prentice Hall.

References:

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

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

3. Malvino & Leach- Digital Principles and Applications, Sixth Edition, Tata McGraw Hill, 2006

MODEL QUESTION PAPER

B.Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - CORE COURSE
FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN]
CA1C01B23 – COMPUTER FUNDAMENTALS AND DIGITAL PRINCIPLES

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 a) RAM b) ROM	1	U
3.	Give two examples of application software.	1	U
4.	Convert (39.625)10 to its binary equivalent	2	Ap
5.	Convert (25.15625)10 to its hexadecimal equivalent	2	Ap
6.	Define Base or Radix of a Number system	2	R
7.	List the different types of PC Operating systems.	2	R
8.	Give the dual expression for A + 0 = A	2	Ap
9.	State and prove Distributive laws of Boolean algebra using Truth Table	2	Ap
10.	Discuss Latch?	3	U
11.	List the use of Registers	3	R
12.	Describe the significance of primary memory.	3	Ap

(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 characteristics of a computer system.	1	U
14.	Differentiate between the characteristics of primary and secondary storage of a computer system.	1	Ap
15.	Distinguish between System software and application software.	2	U
16.	Subtract (110)2 from (1010)2 using 1's complement method	2	Ap
17.	Show NAND gate as Universal gate	2	U
18.	Subtract (11001.101)2 from (11100.110)2	2	Ap
19.	Add the following in BCD numbers 437 and 721	4	Ap
20.	Prove the theorem A+A'B=A+B	3	Ap
21.	Design the logic circuits of the expression (AB)'+AB+AC'+ABC	3	Ap

(6 x 5 = 30 marks)

Part C

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

Qn.No.	Questions	CO	Level of Questions
22.	Obtain the minimal SOP expression for Y=A'B'C+AB'C+ABC'+ABC using K-Map	1	Ap
23.	Simplify the Boolean function using K-Map Y(ABCD)=∑m(0,2,4,5,6,7,8,10,12,14)	2	Ap
24.	Obtain the minimal POS expression for ∏M(0,1,2,4,5,6,9,11,12,13,14,15) and implement it in NOR logic	2	Ap
25.	Explain in detail shift registers with diagram	4	R

(2 x 15 = 30 marks)

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

SEMESTER I

CORE COURSE

CA1C02B23 - OBJECT ORIENTED PROGRAMMING USING C++

Credits : 3

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

Course Overview and Context:

This course provides a solid foundation for object-oriented programming using the C++ programming language. The major emphasis of this course is on the most effective use of the advanced language features, presented in the context of modern software engineering themes of modularity, abstraction, information hiding, and reusability. Fundamental principles of object-oriented design and programming are also introduced.

This course enables the students to pursue career as C++ developers who apply their C++ programming language expertise to develop desktop and mobile software applications, as well as embedded systems.

Course Outcomes:

CO1: Apply programs to implement various computational tasks which requires loops and conditional statements (Apply)

CO2: Apply programs based on arrays and functions (Apply)

CO3: Apply programs to implement the concept of Object Oriented Programming (Apply)

CO4: Design object oriented programs to implement daily life problems and their solutions (Create)

Syllabus Content:

Module I: Introduction (15 Hrs)

Character Set, Delimiters, Types of Tokens, Keywords, Identifiers, Constants, Variables, Rules for defining variables, Data types, Declaring and initialization of variables, Type modifiers, Type conversion, Operators and Expressions- Properties of operators, Priority of operators, Comma and conditional operator, Arithmetic operators, Relational operators, Assignment operators and expressions, Logical Operators, Bitwise operators. Decision Statements If, if-else, nested if-else,

if-else-if ladder, break, continue, goto, switch, nested switch, switch case and nested if. Loop control-for loops, nested for loops, while loops, do while loop.

Module II: Arrays (15 Hrs)

Array, initialization, array terminology, characteristics of an array, one dimensional array and operations, two dimensional arrays and operations. Strings and Concept of Pointers. Functions, Call by Value, Call by Reference, Recursion, Structures, Dynamic Memory Allocation.

Module III: Principles of Object Oriented Programming, Beginning with C++ (12 Hrs)

Procedure Oriented Programming-Object Oriented Programming-Basic concepts of object-oriented programming- Benefits of OOP- Applications of OOP-A simple C++program-Structure of C++ program- Function in C++. public and private functions, Memory allocation for objects, Static data member and functions, Object array, Object as function arguments, Friend Functions, Classes and Objects**.**

Module IV: Constructors and Destructors, Overloading (15 Hrs)

Constructors- Default constructor-Parameterized constructor-Copy constructor- Multiple constructors- Constructors with default arguments- Dynamic constructor-Destructors- Operator overloading- Unary and Binary operator overloading- Overloading using friends- Rules for overloading- Type conversion.

Module V : Inheritance (15 Hrs)

Inheritance- Defining derived classes-Visibility modes-Single, Multilevel, Multiple, Hierarchical And Hybrid inheritance- Virtual base classes- Abstract classes- Constructors in derived classes- Nesting of classes.

Book of Study:

1. E. Balagurusamy - Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill, 2011.

***Reference**:*

1. Ashok N. Kamthane, Object Oriented Programming with ANSI & Turbo C++, First Edition, Pearson India

2. Robert Lafore, Object Oriented Programming in Turbo C++, First Edition, Galgotia Publications.

3. D Ravichandran, Programming with C++, Second edition, Tata McGraw- Hill

MODEL QUESTION PAPER

B.Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - CORE COURSE
FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN]
CA1C02B23 – OBJECT ORIENTED PROGRAMMING USING C++

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.	Explain the rules for defining variables	1	R
2.	Enumerate the different operators in C++.	1	R
3.	Differentiate between break and continue.	1	U
4.	Define array.	2	R
5.	Define Pointers	2	R
6.	Define Encapsulation?	2	R
7.	List out the applications of OOPs.	2	R
8.	Discuss reference variables.	2	Ap
9.	Illustrate the way in which member function of a class is invoked?	2	Ap
10.	There are two classes X and Y. If a is an object of X and b is an object of Y and we want to say a=b; Explain the type of conversion to be used and the place to implement it?	3	U
11.	Explain the number of arguments required in the definition of an overloaded unary operator? Give the syntax.	3	R
12.	Describe the syntax of multiple inheritance in C++.	3	Ap

(10 x 2 = 20 marks)

Part B

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

Qn.No.	Questions	CO	Level of Questions
13.	Define identifier. What are the rules to be followed for identifiers?	1	U
14.	Write a program to illustrate an object array.	1	Ap
15.	Explain the advantages of inline function?	2	U
16.	Differentiate between break and continue statements.	2	Ap
17.	Give the properties of a constructor.	2	U
18.	Summarize the difference between Procedure Oriented Programming and Object Oriented Programming.	2	Ap
19.	Illustrate Function overloading with a sample program.	4	Ap
20.	Illustrate nesting of member functions with a sample program.	3	Ap
21.	Distinguish between private and public access specifiers in C++.	3	Ap

(6 x 5 = 30 marks)

Part C

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

Qn.No.	Questions	CO	Level of Questions
22.	Write a program to demonstrate how a static data is accessed by a static member function.	1	Ap
23.	Write a C++ program to find the area of various 2D shapes such as square, rectangle, triangle, circle and ellipse using function overloading.	2	Ap
24.	Discuss constructors? Explain its properties? Write a program to illustrate constructor overloading.	2	Ap
25.	Implement the multilevel inheritance with a C++ program.	4	Ap

(2 x 15 = 30 marks)

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

SEMESTER I

CORE COURSE

CA1CP01B23 - SOFTWARE LAB -I (OBJECT ORIENTED PROGRAMMING USING C++)

Credits : 2

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

Course Overview and Context:

This course provides a solid practical foundation for object-oriented programming using the C++ programming language. The course will enable the students to deal with a real world problem and to write the respective programming code. It also makes the student develop problem logic which is essential for a software programmer.

This course enables the students to pursue career as C++ developers who apply their C++ programming language expertise to develop desktop and mobile software applications, as well as embedded systems.

Course Outcomes:

CO1: Apply the basic concept of programming using C++ (Apply)

CO2: Create real world programs in C++ implementing arrays and functions (Create)

CO3: Apply programs to implement the concepts of Object Oriented Programming, objects, classes, polymorphism, inheritance etc (Apply)

CO4: Design object oriented programs to implement daily life problems and their solutions (Create)

Syllabus Content:

Object Oriented Programming using C++

1. Programs for I/O operations.
2. Programs based on control structures in programming.
3. Programs based on arrays, functions, recursion, pointers.
4. Programs based on default arguments, function overloading.

5. Programs based on array of objects, friend functions, passing objects as arguments to function.
6. Programs based on operator overloading (binary, unary) using member functions and friend functions.
7. Programs based on constructors, different types of constructors.
8. Programs based on inheritance, different types of inheritance.

SEMESTER I

CORE COURSE

COMMON FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT1C01B23 - DISCRETE MATHEMATICS & TRIGONOMETRY

Credits : 3

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

Course Overview and Context :

This course starts by introducing the alphabets of modern mathematics the mathematical logic and the sets and functions. A brief introduction of theory of Ordered sets & Lattices is also included. The concepts of Circular and hyperbolic functions of a complex variable are then introduced.

Course Outcomes:

CO1: Explain the propositional Calculus in Mathematical Logic and apply various methods for proving theorems. (Analyze)

CO2: Discuss Set theory, Relations, Functions, ordered sets and lattices. (Understand)

CO3: Analyze circular and hyperbolic functions (Analyze)

CO4: Compute the factors of expressions like $x^n - 1$, $x^n + 1$ and $x^{2n} - 2x^n a^n \cos n + a^{2n}$ (Apply)

Syllabus Content:

Module I **(20 Hrs)**

Mathematical Logic:
Propositional logic, Propositional equivalences, Predicates and quantifiers, Rules of inference, Introduction to proofs.
Text 1: Chapter-1 excluding sections 1.4 & 1.7

(problems from Text book 4)

Module II **(12 Hrs)**

Set theory: Sets, set operations, functions

Text 1 : Chapter - 2 excluding section 2.4

(problems from Text book 4)

Module III **(20 Hrs)**

Ordered sets & Lattices : Poset, Product set & order, Hasse diagrams of partially ordered sets, Minimal & Maximal, and First & Last point, Lattices, Lattices as partially ordered sets.
(Text book 2, chapter-4(4.1 to 4.6))
(problems from Text book 4)

Module IV

Trigonometry : **(20 hrs)**

Circular and hyperbolic functions of a complex variable, Separation into real and imaginary parts. Factorisation of x^n-1, x^n+1, $x^{2n} - 2x^n a^n \cos n\theta + a^{2n}$. Summation of infinite series by C + iS method.

(Relevant sections of Text 2, Chapter – V , VII , IX of Text 2)

Book of Study

1. K.H. Rosen: Discrete Mathematics and its Applications (Sixth edition), Tata McGraw Hill Publishing Company, New Delhi.
2. B.S.Vatsa & Suchi Vatsa : Discrete Mathematics (Fourth revised edition), New Age International Publishers, New Delhi.
3. S.L. Loney – Plane Trigonometry Part – II, S. Chand and Company Ltd
4. Ajit Kumar, S.Kumaresan, Bhaba Kumar Sarma:A Foundation Course in Mathematics, Narosa Publishing House, New Delhi.

References

1. J. P Tremblay and R. Manohar- Discrete Mathematical Structures with applications to computer science, Tata McGraw-Hill Education, 2001

2. Lipschutz: Set Theory and related topics (Second Edition), Schaum Outline Series, Tata McGraw-Hill Publishing Company, New Delhi. (Reprint)
3. P.R. Halmos : Naive Set Theory, Springer.
4. Ian Chiswell & Wifrid Hodges: Mathematical Logic, Oxford university press
5. Richard Johnsonbaugh – Discrete Mathematics (Pearsons).
6. Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd
7. Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd
8. McGraw-Hill Publishing Company, New Delhi.
9. H.S. Hall, S.R. Knight: Higher Algebra, Surjit Publications, Delhi.

MODEL QUESTION PAPER
B.Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2023
SEMESTER I - CORE COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS
MT1C01B23 – DISCRETE MATHEMATICS & TRIGONOMETRY

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.	State the absorption laws of mathematical logic.	1	R
2.	Express the statement "Some student in this class has visited Dubai" as a mathematical statement using predicates and quantifiers.	1	U
3.	Let Q(x,y) denote the statement "x=y+3". Identify the truth values of the proposition Q(1,2)and Q(3,0).	1	U
4.	Determine the cardinality of the set {}	2	Ap
5.	Examine whether f(x) = x is a function from R to R.	2	Ap
6.	State Domination laws with regard to set operations	2	R
7.	Define Chain. Give an example.	2	R
8.	Determine whether {1, 2, 5, 10, 30} is a chain under divisibility relation	2	Ap
9.	Examine whether the poset (N, ≤) is a lattice, where N is the set of natural numbers and ≤ is the usual relation "less than or equal to".	2	Ap
10.	Calculate the value of log (-i)	3	U
11.	Write the Gregory series	3	R
12.	Write the relation between sin (ix) and sin hx	3	Ap

(10 x 2 = 20 marks)

Part B

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

Qn.No.	Questions	CO	Level of Questions
13.	Show that " The sum of two odd integers is even " using a direct proof	1	U

14.	Write a proof by contradiction for the theorem''If (3n+2) is odd then n is odd''	1	Ap
15.	Define floor and ceiling function and sketch the graph of these functions.	2	U
16.	Show that (A-B)-C =(A-C)-(B-C) using set identities where A, B, C are any three sets.	2	Ap
17.	Let S be any collection of sets. Show that the relation of set inclusion is a partial order relation on S.	2	U
18.	Construct Hasse diagram for the poset ({1, 2, 4, 6, 8}, /). Also identify two incomparable elements in the poset	2	Ap
19.	Factorise $x^7 - 1$ into real factors	4	Ap
20.	Write the real and imaginary parts of $tan^{-1}(x+iy)$	3	Ap
21.	If $sin(\alpha + i\beta) = cos\theta + isin\theta$, show that $cos^2\alpha = sinh^2\beta$	3	Ap

(6 x 5 = 30 marks)

Part C

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

Qn.No.	Questions	CO	Level of Questions
22.	(a). Show that $\sqrt{2}$ is irrational by giving a proof by contradiction (b). Establish the distributive laws of logic using truth table.	1	Ap
23.	(a). Show that if x is a real number $\lfloor 2x \rfloor = \lfloor x \rfloor + \left\lfloor x + \frac{1}{2} \right\rfloor$. (b). Examine whether the expression $\lceil x+y \rceil = \lceil x \rceil + \lceil y \rceil$ is correct. Justify your answer.	2	Ap
24.	(a)Let D_{24} be the set of all divisors of 24 and let R be the relation defined by aRb if and only if a divides b. List all elements in R.	2	Ap

	(b).Construct the Hasse diagram of D_{24} and find out the greatest element and least element. (b). Determine whether the poset is a lattice		
25.	(a). Write $x^{2n} - 2x^n cosn\theta + 1$ as a product of its factors (b). Write x^8+1 as a product of its factors.	4	Ap

(2 x 15 = 30 marks)

CO : Course Outcomes

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

SEMESTER I

CORE COURSE

Complementary Course for B.Sc. Mathematics, Physics and BCA And Core Course for B.Sc. Computer Applications

ST1B01B23 / ST1C01B23 - DESCRIPTIVE STATISTICS

Credits : 3

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 outlined. This course introduces the basic concepts of Statistics, different steps in a Statistical analysis and 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)

Syllabus Content

Module I **(20 Hrs)**

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 Hrs)**

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 Hrs)**

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 Hrs)**

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.

References:

1. S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).
2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. B.L. Agarwal: Basic Statistics, New Age International (P) Ltd.
4. 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

First Semester

Complementary Course (Statistics) for MATHEMATICS, PHYSICS AND BCA And
Core Course (Statistics) for COMPUTER APPLICATIONS

ST1B01B23 / ST1C01B23– DESCRIPTIVE STATISTICS

Time: 3 hours **Max. 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 of Questions
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

(10 x 2 = 20 marks)

Part B (Short Essay Questions)

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

Q.No.	Question	CO	Level of Questions
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

(6 x 5 = 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

<table>
<tr><td>23</td><td>An Analysis of monthly wages paid to workers in two firms A and B belonging to the same Industry, gives the following results
<table><tr><td></td><td>Firm A</td><td>Firm B</td></tr><tr><td>No. Of wage earners</td><td>550</td><td>650</td></tr><tr><td>Average monthly wages</td><td>50</td><td>45</td></tr><tr><td>Variance of wages</td><td>90</td><td>120</td></tr></table>(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 ?</td><td>3</td><td>An</td></tr>
<tr><td>24</td><td>(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</td><td>4</td><td>E</td></tr>
<tr><td>25</td><td><table><tr><td rowspan="2">Commodity</td><td colspan="2">Price (Rs. Per unit)</td><td colspan="2">Quantity (Kg)</td></tr><tr><td>Base Year</td><td>Current Year</td><td>Base Year</td><td>Current Year</td></tr><tr><td>A</td><td>20</td><td>30</td><td>12</td><td>18</td></tr><tr><td>B</td><td>30</td><td>42</td><td>10</td><td>14</td></tr><tr><td>C</td><td>22</td><td>34</td><td>6</td><td>10</td></tr><tr><td>D</td><td>18</td><td>28</td><td>8</td><td>12</td></tr></table>Calculate Laspeyer's, Paasche's and hence Fisher's Index numbers for the above data.</td><td>5</td><td>E</td></tr>
</table>

(2x15 = 30 marks)

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

SEMESTER II

SEMESTER II

CORE COURSE

CA2C03B23 - DATABASE MANAGEMENT SYSTEMS

Credits : 3

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

Course Overview and Context:

The main aim of the course is to introduce database fundamentals to the students. With this course we shall demonstrate database development activities and prepare students for proficiency in developing database for commercial applications. The subject deals with what is a database and how a database should be designed. It also deals with the popular relational data model and SQL queries in depth. It also concentrates on various techniques for database protection and query optimization. A brief introduction about network and hierarchical data model gives exposure about how a DBMS can be designed. The subject also deals with distributed databases in brief.

This course enables the student to pursue career as database administrator whose responsibilities include installing and testing new versions of the database management system (DBMS) maintain data standards, including adherence to the Data Protection Act. write database documentation, including data standards, procedures and definitions for the data dictionary (metadata) control access permissions and privileges.

Course Outcomes:

CO1 : Describe the fundamental concepts of databases. (Understand)

CO2 :Construct an Entity-Relationship (ER) model and transform to relational schema. (Apply)

CO3 :Develop queries for relational database in the context of practical applications.(Apply)

CO4 :Design relational databases following the design principles and employ control and recovery techniques in transaction processing.(Create)

Syllabus Content:

Module I: Introduction (12 Hrs)

Characteristics of the Database Approach–Database users -DBA , Database Designers ,End users –Advantages of using the DBMS Approach–Data models, Schemas, and Instances–Three-Schema Architecture and Data Independence. DBMS Languages: DDL, DML –The Database System Environment: DBMS Component Modules.

Module II: Relational Model (16 Hrs)

Entity Relationship Modeling: Introduction–Entity Types, Entity Sets, Attributes and Keys–Relationship Types, Relationship Sets, Roles, and Structural Constraints–Weak Entity Types–Notation for ER diagrams–Sample ER diagrams. Relational Model concepts: Domains, Attributes, Tuples, and Relations–Characteristics of Relations–Relational Model Constraints and Relational Database Schemas: Domain Constraints, Key Constraints, Relational Database Schemas, Entity Integrity, Referential Integrity, and Foreign Keys .

Module III: SQL (14 Hrs)

Data Types–Data Definition commands :CREATE, ALTER, DROP-Adding constraints in SQL–Basic SQL Queries :INSERT, SELECT, DELETE, UPDATE –Substring comparison using LIKE operator, BETWEEN operator–Ordering of rows–SQL set operations UNION, EXCEPT , INTERSECT –Complex Queries : Comparison involving NULL and Three-valued logic, Nested queries, EXISTS and UNIQUE functions, Renaming of attributes and Joining of tables, Aggregate functions, Grouping–Managing Views.

Module IV: Normalization and Indexing Structures for Files (15 Hrs)

Normalization: Informal Design Guidelines for Relational Schemas–Functional Dependencies–Normal forms :First Normal Form ,Second Normal Form ,Third Normal Form–General Definitions of Second and Third Normal Forms–BCNF.Indexing Structures for files:-Types of Single-Level Ordered Indexes: Primary Indexes, Clustering Indexes, and Secondary Indexes.

Module V: Transaction Processing and Database Security (15 Hrs)

Transaction Processing: Introduction to Transaction Processing -Transaction and System Concepts–Desirable properties of Transactions. Database Security and Authorization: Types of Security –Control measures –Database Security and DBA–Access Control, User Accounts, and Database Audits–Access Control based on Granting and Revoking Privileges.

***Book of study*:**

1.Ramez Elmasri and Shamkant B.Navathe - DATABASE SYSTEMS , Sixth Edition, Pearson Education.

***References**:*

1. C.J Date- An Introduction to Database Systems, Eighth edition, Pearson Education,2003
2. Reghu Ramakrishnan and Johannes Gehrke- Database Management Systems , Third edition, Mc Graw Hill International Edition.
3. Bipin Desai , An Introduction to Database Systems , First Edition, Galgoria Publications

SEMESTER II

CORE COURSE

CA2C04B23 – DATA STRUCTURES USING C++

Credits : 3

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

Course Overview and Context:

This course introduces the design of data structures for representing information in computer memory. Topics include: Abstract data types and their implementations; Stacks; Queues; Priority queues; Sorting; Recursion. This course assumes that students know how to analyze simple algorithms and data structures. It introduces students to the design of computer algorithms, as well as analysis of sophisticated algorithms.

This course enables the students to pursue career as software developers who effectively organize data and how it can be used to solve a real life problem.

Course Outcomes:

CO1: Choose appropriate data structures to represent data items in real world problems.(Apply)

CO2: Analyze the time and space complexities of algorithms. (Analyze)

CO3: Design programs using a variety of data structures such as stacks, queues, binary trees, search trees, heaps, graphs, and B-trees. (Create)

CO4: Analyze and implement various kinds of searching and sorting techniques. (Analyze)

Syllabus Content:

Module I: (12 Hrs)

Concept of Structured data - Data structure definition, Different types and classification of data structures, Arrays – Memory allocation and implementation of arrays in memory, array operations, Applications - sparse matrix representation and operations, polynomials representation and addition, Concept of search and sort – linear search, binary search, selection

sort, insertion sort, quick sort.

Module II: **(15 Hrs)**

Stacks – Concepts, organization and operations on stacks using arrays (static), examples, Applications - Conversion of infix to postfix and infix to prefix, postfix evaluation, subprogram calls and execution, Multiple stacks representation. Queues - Concepts, organization and operations on queues, examples. Circular queue – limitations of linear queue, organization and operations on circular queue. Double ended queue, Priority queue.

Module III : **(15 Hrs)**

Linked list: Concept of dynamic data structures, linked list, types of linked list, linked list using pointers, insertion and deletion examples, circular linked list, doubly linked lists, Applications linked stacks and queues, memory management basic concepts, garbage collection.

Module IV: **(15 Hrs)**

Trees - Concept of recursion, trees, tree terminology, binary trees, representation of binary trees, strictly binary trees, complete binary tree, extended binary trees, creation and operations on binary tree, binary search trees, Creation of binary search tree, tree traversing methods – examples, binary tree representation of expressions.

Module V: **(15 Hrs)**

File - Definition, Operations on file (sequential), File organizations - sequential, Indexed sequential, random files, linked organization, inverted files, cellular partitioning, hashing – hash tables, hashing functions, collisions, collision resolving methods, Algorithms.

Books of Study :

1. G.S Baluja - Data Structures Through C++ (A Practical Approach), Second Edition-2004, Danapat Rai & Co.
2. Ellis Horowitz and Sartaj Sahni - Fundamentals of Data Structures in C++ , Second Edition, Galgotia Publications.

References:

1. Seymour Lipschutz, Theory and Problems of Data Structures, Schaums Outline Series,2006, McGraw Hill

2. Yedidyah Lanngsam, Moshe Augustein, Aaron M Tenenbaum- Data structures using C and C++ , Second Edition, Prentice Hall

MODEL QUESTION PAPER

B.Sc. DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2023
SEMESTER II - CORE COURSE
FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN]
CA2C04B23 – DATA STRUCTURES USING C++

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 Data Structures.	1	R
2.	Explain the terms overflow and underflow in stack.	1	U
3.	Define the following terms according to binary tree. a) leaves b) root	1	U
4.	Give the polynomial representation with example.	2	Ap
5.	Differentiate between Field and Record	2	Ap
6.	Discuss dynamic allocation of memory .	2	R
7.	Illustrate sorting .	2	R
8.	Convert the expression ((A + B) * C - (D - E) ^ (F + G)) to equivalent Prefix and Postfix expressions.	2	Ap
9.	Give any two applications of linked list .	2	Ap
10.	Define hashing ?	3	U
11.	Name any two collision resolving methods.	3	R
12.	Represent the given sequence of numbers as a binary search tree . 45, 87, 96, 65, 25, 90, 82, 13, 34, 38	3	Ap

(10 x 2 = 20 marks)

Part B

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

Qn.No.	Questions	CO	Level of Questions
13.	Discuss the following :- a) Double ended queue b) Priority queue	1	U
14.	List down any five applications of data structures.	1	Ap
15.	Recall Linkedlist	2	U
16.	Differentiate static memory allocation and dynamic memory allocation.	2	Ap
17.	Describe Linked List and discuss its advantages .	2	U

18.	Write a program to implement Linear search and illustrate with an example.	2	Ap
19.	Explain the polynomial representation and addition using data structures.	4	R
20.	Write an algorithm for inserting a node at the beginning of a circular linked list and also write the advantages and disadvantages of circular linked list.	3	Ap
21.	Explain Garbage collection .	3	R

(6 x 5 = 30 marks)

Part C

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

Qn.No.	Questions	CO	Level of Questions
22.	Write the algorithm to convert the infix expression into postfix form . Do the following :- Convert A + (B * C - (D / E - F) * G) * H into postfix form showing stack status after every step in tabular form.	1	Ap
23.	Explain Linked list in detail and write a program to insertand traverse the element of a linked list.	2	R
24.	Write a program to Implement stack using arrays. Explain each operations in detail.	2	Ap
25.	Write a program to Implement circular queue using arrays. Explain each operations in detail.	4	Ap

(2 x 15 = 30 marks)

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

SEMESTER II

CORE COURSE

CA2CP02B23 – SOFTWARE LAB II (DATA STRUCTURES USING C++ AND DBMS)

Credits **: 2**

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

Course Overview:

The course helps the students understand the different data structures and implement the real life problems using appropriate data structures using C++ programming language. It also helps them in analyzing the various searching and sorting techniques. The course also helps the students in implementation of the database concepts.

This course enables the students to pursue career as software developers who effectively organize data and how it can be used to solve a real life problem.

Course Outcomes:

CO1: Identify the appropriate data structures and algorithms for solving real world problems and Illustrate various kinds of searching and sorting techniques. (Analyse)

CO2: Compare data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems. (Evaluate)

CO3: Implement database concepts using SQL (Apply)

Syllabus Content:

Module I **(14 Hrs)**

Array – Insertion , Deletion, Polynomial addition using arrays Sort – Selection, Insertion, Quick Search – Linear search, Binary search Sparse matrix – Sparse form representation, transpose and addition using the sparse form

Module II **(14 Hrs)**

Stack - Implementation using arrays (linear stack), Infix to postfix conversion, Postfix evaluation Queue – Implementation using arrays (linear queue), Implementation of circular queue.

Module III **(13 Hrs)**

Singly linked list – Implementation using dynamic memory allocation techniques, arrange the list based on the ascending or descending order of the information field, concatenate two linked lists, interchange any two nodes in a list, Implementation of circular list, Implementation of linked stacks and queues. Doubly linked list – Implementation of doubly linked list, Implementation of circular doubly linked list.

Module IV **(13 Hrs)**

Creation of binary search trees, Insertion and deletion of nodes, Tree traversals.

Module V: **(18 Hrs)**

Familiarize with DDL (Create, Alter, Drop), DML (Select..Where, Insert, Update, Delete, Having, Aggregate Functions, Joins etc.) statements

SEMESTER II

CORE COURSE

CORE COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT2C02B23 - NUMBER THEORY, CRYPTOGRAPHY, LAPLACE TRANSFORMS AND CONIC SECTIONS

Credits **: 3**

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

Course Overview and Context :

This course aims to give a simple account of classical number theory and to impart some of the historical background in which the subject evolved. The topics discussed under cryptography are Private key cryptosystem, Private key cryptosystem and knapsack cryptosystem Also it describes conic sections and their properties.

Number theory helps to discover interesting relationships between different sorts of numbers. It includes both experimental and theoretical part. Experimental part leads to questions and suggest ways to answer them and the theoretical part tries to devise an argument which gives conclusive answer to the questions.

Course Outcomes:

CO1: Explain the fundamental concepts of congruences and carry out different mathematical operations modulo an integer. (Analyze)

CO2: Discuss the basics of cryptography and compare the different encryption and decryption techniques. (Analyze)

CO3: Classify the different conic sections and to describe them in Cartesian and polar coordinates. (Analyze)

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

Syllabus Content:

Module I - Number Theory (20 Hrs)

Basic properties of congruence , Linear congruences and Chinese remainder theorem (statement and problems only), Fermat's little theorem and pseudoprimes, Wilson's theorem, The sum and number of divisors, Euler's phi-function

Chapter 4- sections 4.2,4.4 Chapter 5- section 5.2,5.3 ,Chapter 6- section 6.1,chapter7- section 7.2 (Problems from Text book 4)

Module II- Cryptography (15 Hrs)

Introduction to Cryptography , From Caesar Cipher to Public key Cryptography, the Knapsack Cryptosystem

(Section 10.1, 10.2 only of text 1) (Problems from Text book 4)

Module III-Laplace Transform (20 Hrs)

Laplace transform, Linearity of Laplace transform, First shifting theorem, Existence of Laplace transform, Transforms of derivatives, Solution of ordinary differential equation & initial value problem, Laplace transform of the integral of a function, Convolution and Integral equations.

Text 2 (Sections 6.1, 6.2 and 6.5)

(Problems from Text book 5)

Module IV-Conic Sections (17 Hrs)

Conic Sections & quadratic equations, Classifying Conic Sections by eccentricity, quadratic equations & rotations, Conics & parametric equations; Cycloid, Polar coordinates, Graphing in Polar coordinates, Areas & lengths in Polar coordinates, Conic Sections in Polar coordinates.

(Text - 3 Chapter - 10)

Books of Study

1. David M. Burton : Elementary Number Theory, Sixth Edn, TMH.
2. Erwin Kreyszig : Advanced Engineering Mathematics, Ninth Edition, Wiley, India.
3. George B. Thomas Jr. (Eleventh Edition) – Thomas' Calculus, Pearson
4. J.H.Loxton:Number Theory and Cryptography, Cambridge University Press
5. Murray R.Spiegel, Schaum's Outline Series-Laplace Transforms, McGraw Hill

References

1. Manicavachagom Pillay , Natarajan – Analytic Geometry (Part I, Two Dimensions)
2. S.K . Stein – Calculus and analytic Geometry , (McGraw Hill)
3. A. N. Das – Analytic Geometry of Two and Three Dimension (New Central Books)
4. Thomas and Finney - Calculus and analytical geometry (Addison-Wesley)
5. C.Y Hsiung Elementary Theory of Numbers, Allied Publishers
6. Thomas Koshy - Elementary Number Theory with Applications, Academic Press
7. Fernando Rodriguez Villegas: Experimental Number Theory, Oxford University Press
8. Graham Everest, Thomas Ward: An Introduction to Number Theory, , Springer
9. George E. Andrews : Number Theory, HPC.

SEMESTER II

CORE COURSE

Complementary Course for B.Sc. Mathematics & Physics
And
Core Course for B.Sc. Computer Applications
II Semester – Statistics - Course II
ST2C02B23 – PROBABILITY AND RANDOM VARIABLES

Credits : 3

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

Course Overview and Context :

Step by step development of fundamental principles of Statistics, Probability concepts and Random variables are discussed. This course introduces Probability theory as a foundation for Statistics and helps students to understand the basic notions about random variables

Course Outcomes:

CO1: Analyze the degree of correlation between the variables using the concept of correlation (Analyze)

CO2: Articulate the concept of least square to estimate the unknown parameters in regression model (Evaluate)

CO3: Implement the concept of probability and Bayes theorem to understand the uncertainty in a given problem (Apply)

CO4: Illustrate the use of probability density function (pdf) of continuous and discrete random variables(Analyze)

Syllabus Content:

Module I : (16 Hrs)

Introduction to bivariate data**.** Correlation-Different types of Correlation. Concepts of Simple, Multiple and Partial Correlations. Simple Linear Correlation – Methods of finding simple linear Correlation – Scatter Diagram, Covariance Method, Rank Correlation (equal ranks).

Module II : **(16 Hrs)**

Curve Fitting – Method of Least squares- Fitting of Straight Lines, Second Degree Equation, Exponential Curve, Power Curve. Simple Linear Regression – Regression Equations – Fitting and identification, properties.

Module III : **(20 Hrs)**

Probability Concepts – Random Experiment, Sample Space, Events, Probability Measure, Approaches to Probability – Classical, Statistical and Axiomatic, Addition Theorem (upto 3 evens) Conditional Probability, Independence of events, Multiplication theorem (upto 3 events), Total Probability Law, Baye's Theorem and its applications.

Module IV: **(20 Hrs)**

Random Variables – Discrete and Continuous, Probability Distributions – Probability Mass Function; Probability Density Function and Cumulative (distribution) function and their properties, change of variables (Univariate only), Bivariate random variables – Definition – Discrete and Continuous, Joint Probability Density Functions, Marginal and Conditional Distributions, Independence of Random Variables.

References:

1. John E. Freund: Mathematical Statistics, Prentice Hall of India
2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
3. S.P. Gupta: Statistical Methods, , Sultan Chand and Sons, New Delhi
4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
6. B.R. Bhat, Modern Probability Theory, New Age International (p) Ltd.

SEMESTER III

SEMESTER III

CORE COURSE

CA3C05B23 - JAVA PROGRAMMING

Credits : 3

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

Course Overview and Context:

In this course, student will become familiar with features of Java language, they will learn how to write Java code according to Object-Oriented Programming principles, how to design GUI applications and Applets using AWT, how to develop multithreaded and Networking applications and how to create dynamic pages.

This course focuses on Java Programming concepts which is extensively used in all most all the programming fields. It enables the students to pursue career varies from android applications and web server tools to enterprise software.

Course Outcomes:

CO1 : Discuss the basic concepts of object oriented principles (Understand)

CO2 : Apply conditional and looping constructs in Java code.(Apply)

CO3 : Explain the concepts of packages and multithreading. (Analyze)

CO4 : Illustrate multithreaded and Networking applications. (Analyze)

CO5 : Design GUI applications.(Apply)

Syllabus Content:

Module I: (12 Hrs)

Concepts of Object oriented programming, Benefits of OOP, Features of java. Java environment, java tokens, Constant, variables, datatypes, operators Control Statements- branching statements, looping statements, jump statements, labeled loops.

Module II: (15 Hrs)

Defining a Class, Fields declaration, Method declaration, Creating object, Accessing class members, method overloading, Constructors, constructor overloading, super keyword, static Members, Inheritance, overriding methods, dynamic method dispatch, final (variables, methods and classes), abstract methods and classes, interfaces, visibility control.

Module III: **(15 Hrs)**

Arrays- One dimensional arrays, declaration, creation, initialization of arrays, two dimensional arrays, String class. Packages:-java API packages overview(lang, util, io, awt, swing,applet),user defined packages-creating packages, using packages Exception Handling Techniques-try-catch-throw-throws-finally -Multithreading-creation of multithreaded program-Thread class-Runnable interface, Thread lifecycle.

Module IV: **(15 Hrs)**

EventHandling-Delegation EventModel-EventClasses-Sources of Events-Event Listeners-Event classes-Swing-architecture, components of swing-JLabel, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTextField, JText Area, JPanel, JFrame, Layout Managers(FlowLayout, Grid Layout, CardLayout,BorderLayout,BoxLayout,NullLayout).

Module V : **(15 Hrs)**

Working with graphics-Line, Rectangle, Oval, Arc, color setting. JDBC architecture-JDBCconnection, JDBC statement object, JDBC drivers.

Books of study:

1. E. Balagurusamy-Programming with Java, Third Edition, McGraw Hill Companies.
2. K. Somasundaram-PROGRAMMING IN JAVA2, First Edition, Jaico Publishing House.

References:

1. Patrick Naughton-Java2 The Complete Reference, Seventh Edition:
2. Cay S Horstmann & Gary Cornell-Core Java Volume 1- Fundamentals, Eighth edition.
3. Java6 Programming Black Book 2007 Edition, Dreamtech press.

SEMESTER III

CORE COURSE

CA3CP03B23 : SOFTWARE LAB III (JAVA PROGRAMMING)

Credits : 2

Hours per week : 3 **Total Lecture Hours: 54**

Course Overview and Context:

This course aims to impart a practical knowledge of JDBC connectivity, GUI applications and Exception Handling.

This course focuses on Java Programming concepts which is extensively used in all most all the programming fields.

It enables the students to pursue career varies from android applications and web server tools to enterprise software.

Course Outcomes:

CO1 : Build Applet, JDBC connection and swing based Programs (Create)

CO2 : Apply the concepts of Method Overloading, Method Overriding and inheritance. (Apply)

CO3 : Execute abstract class, interfaces and packages. (Apply)

CO4 : Illustrate Exception Handling (Analyse)

CO5 : Design GUI applications. (Apply)

Syllabus Content:

Part I. JDBC connection and swing based Programs

Part II (using class and read inputs from keyboard) Java Programs: Method Overloading-Method Overriding-inheritance- abstract class interfaces packages-Exception Handling-Multithreading.

SEMESTER III

CORE COURSE

CA3C06B23 – OPERATING SYSTEMS

Credits : 4

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

Course Overview and Context:

Operating system is the manager of computer resources. This course is intended to introduce the concepts, structures, features, trends and design mechanism of OS. It covers the fundamentals of multiple operating systems and their associated applications. Students will gain insight into both the difference and similarities between OS architectures.

Course Outcomes:

CO1: Describe the evolution, types, importance, structure and functions of Operating Systems in computing devices(Understand)

CO2: Illustrate the concepts of process management and process scheduling mechanisms in Operating Systems. (Understand)

CO3: Explain Inter process synchronization and determine the methods for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems (Apply)

CO4: Explain the memory management strategies in Operating Systems (Understand)

CO5: Describe secondary storage management and disk scheduling (Understand)

Syllabus Content:

Module I: (12 Hrs)

Introduction: OS Definition, Functions, Evolution of OS,OS Structure Operating System Operations, Operating System Services, User Operating System Interface, System Calls, Types of System Calls.

Module II: (15 Hrs)

Process: Basic Concepts, Process Scheduling, Operations on Processes, Inter process communication, Process Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.

Module III: (15 Hrs)

Process Coordination: Synchronization - The Critical Section problem, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods of handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Module IV: **(15 Hrs)**

Memory Management: Memory Management Strategies - Swapping, Contiguous memory allocation,Paging, Segmentation. Virtual Memory Management- Demand paging, Page Replacement.

Module V: **(15 Hrs)**

Storage Management: File System: - File Concept, Access Methods, Directory structure. Implementing File Systems:-File System Structure, Allocation Methods, Free Space Management, Disk Scheduling.

Books of study:

1. Abraham Silberschatz, Peter Galvin and Greg Gagne - Operating System Principles, Seventh Edition, John Wiley.
2. William Stallings - Operating Systems, Sixth Edition, Prentice Hall of India, Pearson.

References:

1. Milan Kovic - Operating Systems, 2nd Edition, (TMH)

SEMESTER III

CORE COURSE

CA3C07B23 – SYSTEM ANALYSIS AND SOFTWARE ENGINEERING

Credits : 3

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

Course Overview and Context:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems.

This course enables the student to pursue a career as an IT professional who designs, develops and maintains computer software at a company. They use their creativity and technical skills and apply the principles of software engineering to help solve new and ongoing problems for an organization.

Course Outcomes:

CO1: Adapt the basic software engineering methods and practices in their appropriate applications. (Create)

CO2: Distinguish the various software process models such as waterfall model, evolutionary models, etc. (Evaluate)

CO3: Compose the requirements document by understanding the software requirements and identify the software architectural styles to the suitable applications. (Create)

CO4: Devise, design and maintain software.(Create)

Syllabus Content:

Module I **(12 Hrs)**

Information systems concepts, Business information systems; Describing the business organization – organization chart , organization function list ; information system levels - operational, lower, middle, top management; the system development life cycle concepts; hardware and software end products. Life cycle activities- life cycle flow chart, task, management review, baseline specifications, role of system analyst.

Module II **(15 Hrs)**

Introduction to Software Engineering - Definition, Program Vs Software, and Software process, Software Characteristics, Brief introduction about product and process, Software process and product matrices. Software life cycle models - Definition, Waterfall model, Increment process models, Evolutionary process models, Selection of a life cycle model.

Module III **(15 Hrs)**

Software Requirement Analysis and Specification Requirements Engineering type of requirements, Feasibility Studies, Requirement Elicitation, Various steps for requirement analysis, Requirement documentation, Requirement validation, an example to illustrate the various stages in Requirement analysis. Project planning-Size estimation, cost estimation, the constructive cost model (COCOMO).

Module IV **(15 Hrs)**

Software Design - Definition, Various types, Objectives and importance of Design phase, Modularity, Strategy of design, Function oriented design, IEEE recommended practice for software design descriptions. Steps to Analyze and Design Object Oriented Systems. Software Reliability Definition, McCall software quality model, Capability Maturity Model.

Module V **(15 Hrs)**

Software Testing What is testing?, Test, Test case and Test Suit, Verification and Validation, Alpha, beta and acceptance testing, functional testing, techniques to design test cases, boundary value analysis, Equivalence class testing, decision table based testing, cause effect graphing technique, Structural testing path testing, Graph matrices, Data flow testing; Levels of testing Unit testing, integration testing, system testing, validation testing, a brief introduction about debugging and various testing tools.

Book of Study:

1. Marvin Gore & John Stubbe -Elements Of System Analysis, Fourth Edition, Galgotia Book Source.
2. K K Aggarwal, Yogesh Singh - Software Engineering,Third Edition, New Age International Publications.

References :

1. Roger S Pressman - Software Engineering: A Practitioner's Approach, Sixth Edition, McGraw-Hill Higher Education.
2. Ian Sommerville - Software Engineering , Seventh Edition, Pearson Education.
3. Pankaj Jalote - An Integrated approach to Software Engineering, Second Edition, Narosa Publishing Company.

SEMESTER III

CORE COURSE

COMMON COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT3C03B23– CALCULUS

Credits : 4

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

Course Overview and Context:

This course introduces higher order derivatives, Leibnitz theorem, for higher derivatives of the product of two functions. Series expansions of functions using Maclaurin's theorem and Taylor's theorem are discussed. Some applications of derivatives in finding maxima, minima, point of inflection etc are introduced. The concept of partial derivatives and its properties are also introduced.

In integral calculus, certain reduction formulae are discussed. Application of integrals in finding plane area, surface area, arc length, and volume of solids of Revolution are introduced and double and triple integrals and some applications are also introduced.

This course helps to develop advanced calculus skills essential for solving application problems in a variety of fields ranging from physics and biology to business and economics.

Course Outcomes:

CO1: Compute the higher order derivatives of single and multivariable functions. (Apply)

CO2: Determine the series expansions of functions using Taylor's and Maclaurin's series. (Apply)

CO3: Estimate the extreme values of a continuous function of several variables with constrained and unconstrained domains. (Analyze)

CO4: Apply Integral calculus to compute the length of the plane curves and area between curves. (Apply)

CO5: Employ the concept of multiple integrals in mensuration of solids. (Apply)

CO6: Evaluate multiple integrals by transforming into various coordinate systems. (Evaluate)

Syllabus Content:

Module I: Differential Calculus (30 Hrs)

Successive Differentiation. Expansion of functions using Maclaurin's theorem and Taylor's theorem. Concavity and points of inflexion.

(Text 2 : Chapter - 5, Chapter – 6, Chapter 13)

(Problems from Text book 3)

Module II: Partial Differentiation (20 Hrs)

Partial derivatives, The chain rule., Extreme values and saddle points, Lagrange multipliers, Partial derivatives with constrained variables.

(Text 1 Section 14.3 , 14.4, 14.7, 14.8, 14.9)

(Problems from Text book 3)

Module III: Integral Calculus (20 Hrs)

Substitution and area between curves, volumes by slicing and rotation about an axis. Volumes by cylindrical shells, Lengths of Plane Curves, Areas of surfaces of Revolution and the theorems of Pappus.

(Text 1 Section 5.6, 6.1, 6.2, 6.3, 6.5)

(Problems from Text book 3)

Module IV: Multiple Integrals (20 Hrs)

Double integrals, Areas, Double integrals in polar form, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordinates, substitutions in multiple integrals.

(Text 1 Section 15.1, 15.2 (area only) 15.3 , 15.4, 15.6 ,15.7)

(Problems from Text book 3)

Book of Study

1. George B. Thomas Jr. (Eleventh Edition) – Thomas' Calculus, Pearson, 2008.
2. Shanti Narayan and P. K. Mittal– Differential Calculus(S. Chand & Co.) 2008.
3. Advanced Calculus, Schaum's outlines, by Robert C Wrede and Murray Spiegel.

(2nd Edition), 2005, Tata McGraw-Hill.

References

1. T. M. Apostol – Calculus Volume I & II (Wiley India)
2. Widder – Advanced Calculus, 2nd edition
3. K. C. Maity & R. K. Ghosh – Differential Calculus (New Central Books Agency)
4. K. C. Maity & R. K. Ghosh – Integral Calculus (New Central Books Agency)
5. Shanti Narayan, P.K. Mittal - Integral Calculus – (S. Chand & Co.)
6. Anton: Calculus, Wiley.

SEMESTER III

CORE COURSE

Complementary Course for B.Sc. Mathematics & Physics

And

Core Course for B.Sc. Computer Applications

III Semester – Statistics - Course III

ST3B01B23 / ST3C03B23 - PROBABILITY DISTRIBUTIONS

Credits : 4

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

Course Overview and Context :

The different types of Probability distributions with their real life applications are explained. This course helps to impart essential knowledge in Probability distributions and to expose the real-life applications of Probability distributions

Course Outcomes:

CO1: Describe the general characteristics of random variables. (Understand)

CO2: Explain various properties of some important discrete random variables. (Understand)

CO3: Establish the applications of continuous distributions. (Apply)

CO4: Illustrate the uses of Tchebychev's Inequality, Laws of Large numbers, and Central limit theorem. (Analyse)

Syllabus Content:

Module I **(25 Hrs)**

Mathematical Expectation – Expectation of a Random Variable, Moments in terms of Expectations, Moment Generating Functions (m.g.f.) and its properties. Characteristic Functions and its Simple Properties, Conditional Expectation.

Module II **(25 Hrs)**

Discrete Probability Distributions – Uniform: Geometric; Bernoulli; Binomial; Hyper geometric; Poisson; Fitting of Distributions (Binomial and Poisson). Properties – Mean, Variance, m.g.f., Additive property; recurrence relation for moments (binomial and Poisson) Memorylessness property of Geometric distribution.

Module III **(25 Hrs)**

Continuous distributions – Uniform; Exponential; Gamma; Beta (type I and II); Normal; Standard Normal – definitions, Mean, Variance, m.g.f., Additive property, Memorylessness property of exponential distribution Fitting of Normal, Use of Standard Normal Tables for Computation of Various Probabilities.

Module IV **(15 Hrs)**

Tchebycheff‟s Inequality, Weak Law of Large Numbers, Bernoulli‟s Law of Large Numbers, Central Limit Theorem (Lindberg-Levy form) with proof.

References:

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
2. Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.
3. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
4. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill
5. Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.
6. Johnson, N.L, Kotz, S. and Kemp, A.W: Univariate Discrete Distributions, John Wiley, New York.

SEMESTER IV

SEMESTER IV

CORE COURSE

CA4C08B23 - LINUX ADMINISTRATION

Credits : 3

Hours per week : 3 **Total Lecture Hours: 54**

Course Overview and Context:

This course covers the fundamentals of the Linux operating system and command line. The goal of this course is to provide a "starting place" for learning the Linux operating system. Individuals who complete this course should understand Linux as an operating system, basic open source concepts, how Linux is used and the basics of the Linux command line and shell programming.

This course enables students to pursue career as a Linux professional who performs system updates and server configurations. They are responsible for implementing changes in multiple environments from development to production.

Course Outcomes:

CO1: Explain concepts and components of Linux.(Understand)

CO2: Interpret common Linux commands and utilities for general file system operations. (Apply)

CO3: Construct shell scripts for common shell environments.(Create)

CO4: Implement system administration tasks to manage files, software, network, users, services.(Apply)

Syllabus Content:

Module I: Overview of Linux (12 Hrs)

Overview of Linux: What is Linux, Linux‟s root in Unix, Common Linux Features, advantage of Linux, Overview of Unix and Linux architectures, Linux files system, hardware requirements for Linux, Linux standard directories. Commands for files and directories cd, ls, cp,rm, mkdir, rmdir, pwd, file, more, less, Creating and viewing files using cat,file comparisons.

Module II: Essential Linux Commands (16 Hrs)

Essential Linux commands: Processes inLinux, process fundamentals, connecting processes with pipes, redirecting input/output, Background processing,managing multiple processes,process scheduling– (at, batch), nohup command, kill, ps, who, find, sort, touch, file, file processing commands-wc, cut, paste etc Mathematical commands-expr, factor etc. Creating and editing files with vi editor.

Module III: Shell Programming (14 Hrs)

Shell programming-Basics of shell programming, various types of shell available in Linux, comparisons between various shells, shell programming in bash. Conditional and looping statements, case statement, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automating system tasks

Module IV: System Administration (15 Hrs)

System administration-Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of users accounts, creating and mounting file system, checking and monitoring system performance-file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command

Module V: Simple Filter Commands (15 Hrs)

Simple filter commands: pr, head, tail, cut, sort, uniq, tr- Filter using regular expression grep, egrep, sed Understanding various Servers: DHCP, DNS, Squid, Apache, Telnet, FTP, Samba.

Books of Study:

1. Christopher Negus-Red Hat Linux Bible, Wiley Dreamtech India 2005 edition.
2. Yeshwant Kanethkar- UNIX Shell Programming, First edition, BPB.

References:

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. Graham Glass & King Ables- UNIX for programmers and users, Third Edition,Pearson Education.
3. Neil Mathew &Richard Stones - Beginning Linux Programming, Fourth edition, Wiley Dreamtech India.

SEMESTER IV

CORE COURSE

CA4C09B23 : PYTHON PROGRAMMING

Credits : 3

Hours per week : 3 **Total Lecture Hours: 54**

Course Overview and Context :

- To do input/output with files in Python.
- To use Python data structures –- lists, tuples, dictionaries.
- To define Python functions and call them.
- To develop Python programs with conditionals and loops.
- To read and write simple Python programs.

This course enables the students to pursue career as a Python developer who could be a software developer, web developer, data analyst, data scientist, automation tester, machine learning engineer, AI engineer.

Course Outcomes:

CO1: Illustrate uses of conditional (if, if-else and if-elif-else) and iterative (while and for) statements in Python programs.(Apply)

CO2: Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries.(Apply)

CO3: Develop graphical user interface for solutions using Python libraries. (Apply)

CO4: Write programs in Python to process data stored in files by utilizing Numpy, Matplotlib, and Pandas.(Apply)

Syllabus Content:

Module I : Programming Environment and Python Basics (8 Hrs)

Getting started with Python programming – Interactive shell, IDLE, iPython Notebooks, Detecting and correcting syntax errors, How Python works. The software development process – A case study. Basic coding skills – strings, assignment, and comments, Numeric data types and character sets, Expressions, Using inbuilt functions and modules. Control statements – Iteration with

for/while loop, Formatting text for output, A case study, Selection structure (if-else, switchcase), Conditional iteration with while, A case study, Testing control statements, Lazy evaluation.

Module II : **Building Python Programs** **(10 Hrs)**

Strings and text files – Accessing characters, substrings, Data encryption, Strings and number system, String methods, Text files, A case study on text analysis. Design with Functions – Functions as Abstraction Mechanisms, Problem solving with top-down design, Design with recursive functions, Managing a program's namespace, Higher-Order Functions. Lists - Basic list Operations and functions, List of lists, Slicing, Searching and sorting list, List comprehension. Work with tuples. Sets. Work with dates and times, A case study with lists. Dictionaries - Dictionary functions, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries, reverse lookup. Case Study – Data Structure Selection.

Module III : Graphics **(12 Hrs)**

Graphics – Terminal-based programs, Simple Graphics using Turtle, Operations, 2D Shapes, Colors and RGB Systems, A case study. Image Processing – Basic image processing with inbuilt functions. Graphical User Interfaces – Event-driven programming, Coding simple GUI-based programs : Windows, Labels, Displaying images, Input text entry, Popup dialog boxes, Command buttons, A case study.

Module IV : Object Oriented Programming **(12 Hrs)**

Design with classes - Objects and Classes, Methods, Instance variables, Constructor, Accessor and Mutator, Data-Modeling Examples, Structuring classes with inheritance and polymorphism. Abstract classes, Interfaces, Exceptions - Handle a single exception, handle multiple exceptions.

Module V : Data Processing **(12 Hrs)**

The OS and sys modules, NumPy - Basics, Creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers. Plotting and visualization. Matplotlib - Basic plot, Ticks, Labels,

and Legends. Working with CSV files. – Pandas - Reading, Manipulating, and Processing Data. Introduction to Micro services using Flask.

Book of Study:

1. Kenneth A Lambert., Fundamentals of Python : First Programs, 2/e, Cengage Publishing, 2016

References:

1. Wes McKinney, Python for Data Analysis, 2/e, Shroff / O'Reilly Publishers, 2017 3.
2. Flask: Building Python web services, Jack Stouffer, Shalabh Aggarwal, Gareth Dwyer, PACKT Publishing Limited, 2018

SEMESTER IV

CORE COURSE

CA4P04B23: SOFTWARE LAB IV (PYTHON PROGRAMMING)

Credits : 3

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

Course Overview and Context :

- To do input/output with files in Python.
- To use Python data structures –- lists, tuples, dictionaries.
- To define Python functions and call them.
- To develop Python programs with conditionals and loops.
- To read and write simple Python programs.

This course enables the students to pursue career as a Python developer who could be a software developer, web developer, data analyst, data scientist, automation tester, machine learning engineer, AI engineer.

Course Outcomes:

CO1: Illustrate uses of conditional (if, if-else and if-elif-else) and iterative (while and for) statements in Python programs.(Apply)

CO2: Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries. (Apply)

CO3: Develop graphical user interface for solutions using Python libraries. (Apply)

CO4: Write programs in Python to process data stored in files by utilizing Numpy, Matplotlib, and Pandas. (Apply)

Syllabus Content:

Basic coding skills – strings, assignment, and comments, Numeric data types and character sets

Control statements – Definite Iteration with for loop, Formatting text for output, Selection structure (if-else, switch-case), Conditional iteration with while loop, A case study.

Strings – Accessing characters, substrings, Data encryption, Strings and number system, String methods,

Lists - Basic list Operations and functions, List of lists, Slicing, Searching and sorting list, List comprehension.

Work with tuples. Sets. Work with dates and times, A case study with lists.

Dictionaries - Dictionary functions, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries, reverse lookup.

Image Processing – Basic image processing with inbuilt functions.

Matplotlib : Basic plot, Ticks, Labels, and Legends.

SEMESTER IV

CORE COURSE

COMMON COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT4C04B23-VECTOR CALCULUS, THEORY OF EQUATIONS AND MATRICES

Credits : 4

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

Course Overview and Context:

This course discusses equations of lines and planes in space, introduces elementary methods to find roots of an equation, gives an overview on relation between roots and the coefficients of an equation.

This course helps the students to develop a deep understanding of the concept of vectors which are a prerequisite to various fields of science and engineering (such as electromagnetic fields, fluid flow and gravitational fields). It also helps the students to give a mathematical description of the three dimensional space which is required for solving many real life problems. This course helps to understand the analytic geometry of space and use these geometric ideas to study motion in space and the calculus of functions of several variables, with their many important applications in science, engineering, economics, and higher mathematics.

Course Outcomes:

CO1: Determine the equations of lines and planes in space and apply vector differentiation in the study of motion. (Apply)

CO2: Compute line integrals and surface integrals and apply them to determine the various characteristics of a vector field. (Apply)

CO3: Analyze an algebraic equation and evaluate its roots using different methods. (Analyze)

CO4: Illustrate the properties of matrices and compute the solution of linear equations using matrix algebra. (Apply)

Syllabus Content:

Module I - A quick review **(20 Hrs)**

(A quick review) Lines and planes in space, Vector functions Arc length and Unit tangent vector, Curvature and Unit normal vector, torsion and Unit Binormal vector, Directional derivatives and gradient vectors , tangent planes and normal lines (ONLY).

(Sections 12.5 , 13.1 , 13.3 , 13.4 , 13.5 , 14.5 , 14.6(tangent planes and normal lines only)of Text 1)

(Problems from Text book 4)

Module II - Integration in Vector Fields **(30 Hrs)**

Line integrals, Vector fields and line integrals: Work, Circulation and Flux, Path Independence, Conservative Fields and Potential Functions (Proofs of theorems excluded), Green's theorem in the plane (Statement and problems only), Surfaces and Area: Parameterizations of surfaces, Implicit surfaces, Surface integrals, Stokes' theorem (Statement and simple Problems only), Divergence theorem only (Statement and Problems only) Gauss‟ law onwards are excluded.

Sections 16.1 to 16.6 and relevant portions from 16.7 & 16.8 of Text 1

(Problems from Text book 4)

Module III - Theory of Equations **(20 Hrs)**

Statement of fundamental Theorem of algebra. Deduction that every polynomial of degree n has n and only n roots. Relation between roots and coefficients. Transformation of equations. Reciprocal equations.

(Chapter 6 sections 1 – 10,and chapter 12 of Text 2)

(Problems from Text book 4)

Module IV- Matrices **(20 Hrs)**

Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Equivalent matrices, Row Canonical form, Normal form,

Elementary matrices only. Systems of Linear equations: System of non-homogeneous, solution using matrices, Cramer's rule, system of homogeneous equations, Characteristic equation of a matrix, characteristic roots and characteristic vectors. Cayley-Hamilton theorem (statement only) and simple applications

(Text 3, Chapters – 5, 10, 19, 23)

(Problems from Text book 4)

Books of Study:

1. George B. Thomas Jr. (Eleventh Edition) – Thomas' Calculus, Pearson, 2008.
2. Bernard and Child - Higher Algebra, AITBS Publishers, India
3. Frank Ayres Jr : Matrices, Schaum's Outline Series, TMH Edition.
4. Engineering Mathematics, N.P. Bali, Manish Goyal

References

1. Erwin Kreyszig : Advanced Engineering Mathematics, 8th ed., Wiley.
2. H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.
3. Shanti Narayan, P.K Mittal – Vector Calculus (S. Chand)
4. Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics
5. Ghosh, Maity – Vector Analysis (New Central books)
6. Quazi Shoeb Ahamad - Numerical and Statistical Techniques (Ane Books).

SEMESTER IV

CORE COURSE

Complementary Course for B.Sc. Mathematics & Physics
And
Core Course for B.Sc. Computer Applications
IV Semester – Statistics - Course IV
ST4B01B23 / ST4C04B23 - STATISTICAL INFERENCE

Credits : 4

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

Course Overview and Context :

The methods of drawing conclusions about a population by analyzing and studying samples drawn from the population is the focus of this course. Helps to equip the students with the theory essential for estimation of unknown parameters and testing of hypotheses and to expose them to its real-life applications.

Course Outcomes:

CO1: Explain the concepts of statistic and sampling distribution (Understand)

CO2: Illustrate the methods of estimating parameters of a population (Apply)

CO3: Describe the procedure of testing of hypotheses (Understand)

CO4: Explain Standard error and testing procedure for parameters of a normal population using large and small samples (Analyze)

CO5: Evaluate various statistical techniques for modeling and exploring practical situation (Evaluate)

Syllabus Content:

Module I : (20 Hrs)

Sampling Distributions – definition, Statistic, Parameter, Standard Error, Sampling Distributions of Mean and Variance, χ^2 , t and F (without derivation), properties, Inter relationships.

Module II : (30 Hrs)

Concepts of Estimation, Types of Estimation – Point Estimation; Interval Estimation, Properties of Estimation – Unbiasedness, Efficiency; Consistency; Sufficiency. Methods of Estimation –

MLE, Methods of Moments, Method of Minimum Variance, Cramer Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

Module III : (20 Hrs)

Testing of hypothesis- Statistical hypothesis, Simple and composite hypothesis Null and Alternate hypothesis, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman Pearson approach

Module IV: (20 Hrs)

Large Sample tests – Z test, Chi-Square test-goodness of fit, test of independence. Small sample tests –Normal tests, t - test, Chi-square test, F- test.

References:

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
2. Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.
3. S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
4. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
5. Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

SEMESTER IV

CORE COURSE

ST4C05B23- SAMPLE SURVEY AND DESIGN OF EXPERIMENTS

Credits : 4

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

Course Overview and Context:

The objective of the course is to provide a sound practical background to sampling and particularly to design and analysis of sample survey. The course covers a broad range of situations in which sampling is used, with emphasis placed on sample surveys. The central aim is to provide the sound general background needed for carrying out a sample survey, including both practical aspects and the essential details on design and analysis.

This course provides an introduction to sampling theory.

Three major topic areas are addressed:

- Simple random sampling
- Stratified random sampling
- Systematic sampling

This course also gives an introduction to the lay out and analysis of basic designs namely CRD, RBD, LSD.

Course Outcomes:

CO1: Explain the concepts of Census and sample survey and estimate the unbiased estimates of parameters and their variances for SRSWR and SRSWOR. (Understand)

CO2: Describe the concepts of Stratified random sampling and Systematic sampling and estimate the unbiased estimates of the parameters and their variances in Stratified sampling for SRSWR and SRSWOR. (Understand)

CO3: Explain the concepts of Experimentation, Linear estimation and ANOVA. (Analyze)

CO4: Illustrate the layout and analysis of CRD, RBD, LSD and missing plot techniques. (Analyze)

CO5: Organize sample surveys using sampling techniques (Analyze)

Syllabus Content:

Module I : **(20 Hrs)**

Basic concepts: Census and Sampling, Principal steps in a sample survey- Simple random sampling: Simple random sampling with and without replacement, unbiased estimates of the population mean and population total-their variances and estimates of the variances

Module II : **(30 Hrs)**

Stratified random sampling: Estimation of the population mean and population total-their variances and estimates of the variances, proportional allocation and Neyman allocation of sample sizes, cost function – optimum allocation, comparison with simple random sampling, Systematic Sampling: Linear and Circular Systematic Sampling (basic concepts only)

Module III : **(20 Hrs)**

Principles of experimentation, linear estimation, estimability of parametric functions BLUE, Gauss Markov theorem(without proof), ANOVA of one way & two way classified data

Module IV: **(20 Hrs)**

Lay out and analysis of basic designs CRD, RBD, LSD missing plot techniques.

Books of Study:

1. D. Singh and F.S. Choudhary: Theory and Analysis of sample survey Designs, Wiley Eastern Ltd.
2. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand & Co. New Delhi
3. Cochran W.G.: Sampling Techniques, Wiley Eastern Ltd.
   Design and Analysis of Experiments 2/e (1986) M.N. Das and N.C. Giri, Wiley Eastern Limited,
4. Linear Estimation and Design of Experiments (1987) D.D. Joshi, Wiley Eastern Limited.

References:

1. Murthy M.N.: Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
2. Sukhatme and Sukhatme: Sample survey methods and its applications, Indian Society of Agricultural Statistics.
3. Design and Analysis of Experiments 5/e (2001) D.C. Montgomery, John Wiley and Sons, Inc.

SEMESTER V

SEMESTER V

CORE COURSE

CA5C10B23 – MACHINE LEARNING

Credits : 4

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

Course Overview and Context:

- To introduce the prominent methods for machine learning
- To study the basics of supervised and unsupervised learning

This course enables the students to pursue career in Designing ML systems.,Researching and implementing ML algorithms and tools., Selecting appropriate data sets, Picking appropriate data representation methods.

Course Outcomes:

CO1 : Differentiate various learning approaches, and to interpret the concepts of supervised learning. (Understand)

CO2 : Apply theoretical foundations of decision trees to identify best split and Bayesian classifier to label data points (Apply)

CO3 : Illustrate the working of classifier models like SVM, Neural Networks and identify classifier model for typical machine learning applications (Understand)

CO4 : Illustrate and apply clustering algorithms and identify its applicability in real life problems (Understand)

CO5 : Compare the different dimensionality reduction techniques (Understand)

Syllabus Content:

MODULE I : Introduction (12 Hrs.)

Introduction: Machine Learning, Applications, Supervised Learning: Learning a Class from Examples, Unsupervised Learning, Semi Supervised learning, Reinforcement Learning. Applications of Machine Learning. Issues in Machine Learning.

MODULE II : **Preparing to Model** **(15 Hrs.)**

Basic types of data in Machine Learning, Exploring structure of data, Data quality and remediation, Data Preprocessing, Basics of Feature Engineering, Feature Transformation, Bayesian Concept Learning.

MODULE III : Supervised Learning : Classification **(15 Hrs.)**

Introduction , Example of Supervised Learning, Classification Model, Classification Learning steps, Common Classification Algorithms, KNN, Decision Tree, Random Forest Models, Support Vector Machines. Regression, Simple linear regression, Multiple linear regression, Logistic regression, Maxmium Likelihood Estimation.

MODULE IV : Unsupervised Learning **(15 Hrs.)**

Application of Unsupervised Learning, Clustering, Different types of Clustering techniques, Finding Pattern using Association Rule.Apriori algorithm.

MODULE V : Basics of Neural Network **(15 Hrs.)**

Understanding the Biological Neuron, Exploring Artificial Neuron, Types of Activation Functions, Implementations of ANN, Architectures of Neural Network. Learning process in ANN, Backpropagation, Deep Learning.

Book of Study

1. Machine Learning , Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Publications.

SEMESTER V

CORE COURSE

CA5P05B23: SOFTWARE LAB V : (MACHINE LEARNING ALGORITHMS IMPLEMENTATION USING PYTHON)

Credits : 3

Hours per week : 2

Total Lecture Hours : 36

Course Overview and Context:

- To introduce the prominent methods for machine learning
- To study the basics of supervised and unsupervised learning

This course enables the students to pursue career in Designing ML systems.,Researching and implementing ML algorithms and tools., Selecting appropriate data sets, Picking appropriate data representation methods.

Course Outcomes:

CO1 : Report modern notions in predictive data analysis (Understand)

CO2 : Select data, model selection, model complexity and identify the trends (Analyze)

CO3 : Review a range of machine learning algorithms along with their strengths and weaknesses (Understand)

CO4 : Develop predictive models from data and analyze their performance (Create)

Syllabus Content:

Write a python program to compute

- Central Tendency Measures: Mean, Median, Mode
- Measure of Dispersion: Variance, Standard Deviation

Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy

Study of Python Libraries for ML application such as Pandas and Matplotlib

Write a Python program to implement Simple Linear Regression

Implementation of Multiple Linear Regression for House Price Prediction using sklearn

Implementation of Decision tree using sklearn and its parameter tuning

Implementation of KNN using sklearn

Implementation of Logistic Regression using sklearn

Implementation of K-Means Clustering

SEMESTER V

CORE COURSE

COMMON COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT5C06B23 - REAL ANALYSIS I

Credits : 4

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

Course Overview and Context:

This course provides a systematic approach to the development of the subject Real Analysis. It introduces several fundamental concepts of Real Analysis including the well-ordering principle, the completeness axiom, the Archimedean property and the real sequences. Also to the end more abstract notion of a metric space is introduced.

A study of real analysis allows for an appreciation of the many interconnections with other mathematical areas. This course introduces the important ideas and methodologies of pure math in the context of material you are already familiar with.

Course Outcomes:

CO1: Discuss the fundamental properties of the real numbers that support the formal development of Real analysis. (Understand)

CO2: Describe basic topological concepts and characterizations of real number system such as the notion of open and closed sets. (Understand)

CO3: Analyze real sequences, their convergence, some basic and significant theorems involving sequences and their applications. (Analyze)

CO4: Explain elementary metric space theory including continuity, connectedness, compactness and completeness. (Apply)

Syllabus Content:

Module 1 **(15 Hrs)**

Intervals, Bounded and unbounded sets, supremum, infimum. Order completeness in R. Archimedian property of real numbers. Dedekinds form of completeness property.

(Sections 2.6, 3, 4.1 ,4.2, 4.3, 4.4 of text 1 and problems from relevant sections of Text 2 and Text 3)

Module II **(25 Hrs)**

Neighbourhood of a point. Interior point of a set. Open set. Limit point of a set. Bolzano weierstrass theorem for sets. Closed sets, closure of a set. Dense sets. Countable and uncountable sets.

(Sections: 1.1,1.2,1.3,2,2.1,2.2,3.1,3.2,3.3,3.4,3.5,4 of chapter 2 of text 1 and problems from relevant sections of Text 2 and Text 3)

Module III **(30 Hrs)**

Real sequences. The range, bounds of a sequence. Convergence of sequences. Some theorems, limit points of a sequence. Bolzano weierstrass theorem for sequences. Limit inferior and superior. Convergent sequences. Cauchy's general principle of convergence. Cauchy's sequences. Statements of theorem without proof in algebra of sequences. Some important theorems and examples related to them. Monotonic sequences, subsequences.

(Sections : 1.1,to 1.5, 2.to2,3. 4 to5 ,6 ,6.1 ,7,8 9, 9.1 of chapter 3 of text 1 and problems from relevant sections of Text 2 and Text 3)

Module IV **(20 Hrs)**

Metric Spaces : Definitions &examples, Open & Closed Sets, Convergence & Completeness,Continuity & Uniform Continuity.

(Section 1 to 4 of chapter 19 of text 1and problems from relevant sections of Text 2 and Text 3)

Textbook

1. S.C.Malik, Savitha Arora - Mathematical analysis. Revised Second edition.
2. Stephen Abbott, Understanding Analysis (Undergraduate Texts in Mathematics) , Second Edition.
3. W.J. Kaczor, M.T. Nowak, Problems in Mathematical analysis , Real numbers, Sequences and series,Volume 4

References

1. Robert G Bartle and Donald R Sherbert –Introduction to real analysis 3rd edition.Wiley
2. W. Rudin - Principles of Mathematial Analysis, Second Edition, Mcgraw-hill, 1964.
3. Richard R Goldberg – Methods of real analysis 3rd edition , Oxford and IBM Publishing Co (1964)
4. Shanti Narayan – A Course of mathematical analysis , S Chand and Co Ltd(2004)
5. Elias Zako – Mathematical analysis Vol1, Overseas Press, New Delhi(2006)
6. J. M .Howie – Real Analysis, Springer 2007
7. K.A Ross - Elementary Real Analysis, Springer, Indian Reprint

SEMESTER V

CORE COURSE

COMMON COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT5C07B23 - DIFFERENTIAL EQUATIONS

Credits : 4

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

Course Overview and Context:

In this course we are studying the ordinary differential equation involving one independent and one or more dependent variables. The integrals of ordinary differential equations are plane curves. Also we study the differential equation involving one dependent and more than one independent variable that are partial differential equations.

Course Outcomes:

CO1: Classify different types of differential equations.(Understand)

CO2: Construct differential equations by eliminating constants or functions.(Apply)

CO3: Compute the general and particular solutions of first order and higher order differential equations and find the orthogonal or oblique trajectories.(Apply)

CO4: Apply power series method to find the solutions of ordinary differential equations.(Apply)

CO5 : Solve partial differential equations using the method of grouping and the multiplier method.(Apply)

Syllabus Content:

Module I :Ordinary Differential Equations **(20 Hrs)**

Exact differential equations and integrating factors (proof of theorem 2.1 excluded), separable equations and equations reducible to this form, linear equations and Bernoulli equations, special integrating factors and transformations. Orthogonal and oblique trajectories.

(Sections 2.1, 2.2, 2.3, 2.4, 3.1 of Text 1 and problems from relevant sections of Text 3)

Module II **(30 Hrs)**

Basic theory of linear differential equations. The homogeneous linear equation with constant coefficients. The method of undetermined coefficients, Variation of parameters, The Cauchy – Euler equation.

(Section 4.1, 4.2, 4.3, 4.4, 4.5 of Text 1 and problems from relevant sections of Text 3)

Module III **(25 Hrs)**

Power series solution about an ordinary point, solutions about singular points, the method of Frobenius, Bessel"s equation and Bessel Functions, Differential operators and an operator method.

(Section 6.1, 6.2, 6.3, 7.1 of Text 1)

Module IV: Partial Differential Equations **(15 Hrs)**

Surfaces and Curves in three dimensions, solution of equations of the form dx/P = dy/Q = dz/R , Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method.

(Chapter 1, section 1 and 3 & Chapter 2, Section 1, 2 and 4 of text 2)

Books of Study:

1. Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).
2. Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)
3. Schaum's Outlines- Differential Equations - Fourth Edition- Richard Bronson, Gabriel B.Costa , Mc Graw Hill

References:

1. A.H.Siddiqi & P. Manchanda – A First Course in Differential Equation with Applications (Macmillian)
2. George. F. Simmons – Differential equation with applications and historical notes (Tata Mc Graw Hill)

3. W.E. Boyce & R.C. Diprima - Elementary Differential Equations and boundary value Problems, (Wiley India)
4. S. Balachandra Rao & H. Ranuradha – Differential Equation with Applications and Programs (Universities Press)
5. R. K. Ghosh & K. C. Maity - An Introduction to Differential Equations (New Central Books Agency)
6. B. K. Dutta – Introduction to Partial Differential Equations (New Central Books) Murrary –.Differential Equations. Macmillian
7. E.A. Coddington - An Introduction to Ordinary Differential Equations, PHI.
8. Sankara Rao - Introduction to Partial Differential Equation,2nd edition, PHI.
9. Zafar Ahsan - Differential Equations and their Applications , 2nd edition, PHI

SEMESTER V

CORE COURSE

ST5C06B23- ENVIRONMENTAL STUDIES, HUMAN RIGHTS AND NUMERICAL METHODS

Credits : 4

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

Course Overview and Context:

Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers. The syllabus of environmental studies includes environmental studies according to the UGC directions and also human rights. The course also deals with numerical methods, its derivations and evaluation of roots with respect to simultaneous linear equations. The overall goal of the field of numerical analysis is the design and analysis of techniques to give approximate but accurate solutions to hard problems.

Course Outcomes:

CO1: Explain the multidisciplinary nature, important theories and concepts of environmental science, ecosystems, natural resources and conservation (Understand)

CO2: Identify various types of natural resources and develop skills and commitment to act independently and collectively to sustain and enrich the environment (Apply)

CO3: Discuss the major environmental problems, its causes, the social and economic consequences and potential solutions (Understand).

CO4: Identify issues and problems relating to the human rights (Understand)

CO5:Derive numerical methods for evaluating the roots and solutions for algebraic, transcendental and simultaneous linear equations.(Apply)

Syllabus Content:

Module I: **(20 Hrs)**

Unit 1 : Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness.

Unit 2 : Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on 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.

Unit 3: 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: **(25 Hrs)**

Unit 1: Biodiversity and its conservation • Introduction • Bio-geograhical 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

Unit 2: Environmental Pollution Definition Causes, effects and control measures of: - · Air pollution · Water pollution · Soil pollution · .Marine pollution · Noise pollution · Thermal pollution

· Nuclear hazards Pollution case studies Disaster management: floods, earthquake, cyclone and landslides.

Unit 3: 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 **(25 Hrs)**

Unit 1- 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).

Unit-2 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

Unit-3 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, Kasthurirangan report. Overexploitation of groundwater resources, marine fisheries, sand mining etc.

Module IV **(20 Hrs)**

Solution to algebraic and transcendental equations:- Bisection Method, Iteration method, Regula - falsi method, Newton-Raphson method. Solution to Simultaneous linear equations:- Gauss elimination method, Gauss-Jordan methods, Jacobi‟s method, Gauss-Seidel method Internal: Field study · Visit to a local area to document environmental grassland/ hill /mountain · Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc · Study of simple ecosystem-pond, river, hill slopes, etc (Field work Equal to 5 lecture hours).

Books of study:

1. Bharucha, E. (2010). *Text Book for Environmental studies for undergraduate Courses*, University Grants Commission, New Delhi.

References:

2. Agarwal, K. C. (2001). *Environmental Biology*, Nidi Publishers Ltd, Bikaner.
3. Gupta, S.C. and. Kapoor, V.K .(2014). *Fundamentals of Applied Statistics*, Sultan Chand & Co.New Delhi.
4. Clark.R.S., *Marine Pollution*, Clanderson Press Oxford (Ref)
5. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001
6. *Environmental Encyclopedia*, Jaico Publ. House. Mumbai. 1196p .(Ref)
7. Dc A.K., *Environmental Chemistry*, Wiley Eastern Ltd.(Ref)
8. Down to Earth, Centre for Science and Environment (Ref)

SEMESTER VI

SEMESTER VI

CORE COURSE

CA6C11B23 – COMPUTER NETWORKS AND INTRODUCTION TO CLOUD TECHNOLOGY

Credits : 4

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

Course Overview and Context:

The subject introduces the concept of networks, different topologies and network devices. The OSI reference model is designed to introduce different layers. The layers are discussed in detail in later chapters of the subject. Error detection and correction mechanisms are dealt with to give an exposure about how actually the network handles the data. The discussion about routing algorithms gives exposure to the sending of information in a network. Congestion handling is also dealt with in the subject.

Course Outcomes

CO1: Define basic concepts of Data communication and Computer Networks.(Understand)

CO2: Identify different Network Models, their functions and transmission media. (Remember)

CO3: Classify various topologies, networking types and protocols.(Understand)

CO4: Apply the encoding schemes, error correction and detection methods, switching techniques as per given network. (Apply)

CO5: Compare different network devices, addressing schemes, security threats and crypting method (Evaluate)

Syllabus Content:

Module I **(18 Hrs)**

Introduction to Networks, Data and signals-analog and digital, periodic analog signals,digital signals, bit rate, baud rate, bandwidth. Transmission impairments- attenuation, distortion and noise. Data communication protocols and standards, Network models - OSI model-layers and their

functions. TCP/IP protocol suite. Bandwidth utilization Multiplexing: FDM, TDM, spread spectrum. Transmission Media- guided media and unguided media. Switching: message, Circuit and packet switched networks, datagram networks, virtual- circuit networks.

Module II **(18 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).Multiple Access Protocols. Random Access-ALOHA, CSMA. Wired LANs-IEEE standards, wirelessLANs-Bluetooth, Cellular Telephony

Module III **(18 Hrs)**

Network layer and Transport layer: Repeaters, Bridges, Gateways and routers. Logical addressing – IPV4 and IPV6 addressing, Internet protocol - IPv4 and IPv6. Connectionless and Connection Oriented Services: UDP and TCP. Congestion Control, Quality of Service.

Module IV **(18 Hrs)**

Application layer: HTTP, FTP, SMTP, DNS. Network security: Common Threats- Firewalls (advantages and disadvantages), Cryptography.

Module V **(18 Hrs)**

Introduction: Historical development, Vision of Cloud Computing, Characteristics of Cloud, Cloud Computing Architecture: Cloud Reference Model, Types of Clouds.

Books of study

1) B. A. Forouzan - Data communication and Networking, Fourth edition-, TMH
2) Andrew S Tanenbaum - Computer Networks, Fourth Edition, Prentice Hall of India.
3) Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub

References

1. W. Stallings, "Data and Computer Communication", McMillan.

2. J. Martin, "Computer Network and Distributed Data Processing", PHI.
3. W. Stallings, "Local Networks", McMillan.
4. M.Schwertz, "Computer Communication Network Design and Analysis", PHI.
5. S. Keshav, "An Engineering Approach to Computer Networking, Pearson", 2000

SEMESTER VI

CORE COURSE

COMMON COURSE FOR B.Sc. COMPUTER APPLICATIONS [TRIPLE MAIN] & MATHEMATICS

MT6C12B23 – LINEAR ALGEBRA

Credits : 4

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

Course Overview and Context:

This course revises the concepts of Matrix Algebra. Vector spaces and concepts of basis and dimension which lay the foundations of Linear algebra are introduced. Properties of linear transformations, eigen values, eigen vectors and Euclidean inner product are covered in detail.

This course is intended to develop the fundamental math skills required for machine learning and data science. It is a prerequisite subject to study prior to getting started in data analysis and artificial intelligence.

Course Outcomes:

CO1 : Analyze the basic concepts of vector spaces (Analyze)

CO2 : Illustrate the fundamental properties of linear transformations (Apply)

CO3 : Compute the eigen values and eigen vectors of matrices (Apply)

CO4 : Illustrate the Diagonalization of a Matrix. (Apply)

CO5 : Evaluate the Euclidean inner product of vectors (Analyze)

Syllabus Content:

Module I **(30 Hrs)**

Vector spaces: Vectors, Subspace, Linear Independence, Basis and Dimension, Row Space of a Matrix, Rank of a matrix (Theorem statements and problems only of 2.6) .

(Chapter 2 - Sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6 (Statements and problems only of 2.6)of text 1)

(Problems from relevant sections of textbooks 2 and 3)

Module II **(35 Hrs)**

Linear Transformations: Functions, Linear Transformations, Matrix Representations, Change of Basis, Properties of Linear Transformations. (Chapter 3 - Sections 3.1, 3.2, 3.3, 3.4, 3.5 of text 1)

(Problems from relevant sections of textbooks 2 and 3)

Module III **(20 Hrs)**

Eigen vectors and eigen values, properties of eigen values and vectors, Diagonalization of Matrix (Chapter 4 - Sections 4.1,4.2,4.3 of Text book 1) (Problems from relevant sections of textbooks 2 and 3)

Module IV **(5 Hrs)**

Euclidean Inner product – orthogonality.

(Chapter 5 – Sections 5.1 of Text book 1) (Problems from relevant sections of textbooks 2 and 3)

Books of Study:

1. Richard Bronson, Gabriel B. Costa- Linear Algebra An Introduction (Second Edition), Academic Press 2009, an imprint of Elsevier.
2. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra Fourth Edition, Prentice Hall, 2002.
3. Schaum's Outline Linear Algebra Sixth Edition, McGraw- Hill, Education, 2018.

References:

1. I. N. Herstein – Topics in Algebra , Wiley India
2. Harvey E. Rose - Linear Algebra, A Pure Mathematical Approach, Springer
3. Devi Prasad, - Elementary Linear Algebra,Narosa Publishing House
4. K. P. Gupta – Linear Algebra, Pragathi Prakashan
5. Promode Kumar Saikia – Linear Algebra, Pearson
6. Derek J. S. Robinson – A Course in Linear Algebra with Applications, Allied.
7. Singaravalu - Differential Equations, Fourier Series and Laplace Tranforms
8. Hanna, J.R and J.H Rowland, Fourier Series, Transforms and Boundary Value Problems, 2 nd Ed. New York, Wiley,1990.

SEMESTER VI

CORE COURSE

ST6C07B23: OPTIMIZATION TECHNIQUES

Credits : 4

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

Course Overview and Context:

The objective of this course is to make students acquire a systematic understanding of optimization techniques. The course introduces the history and significance of Operations Research .The course also deals with the linear optimization and will discuss in detail the problem formulation and the solution approaches. The course covers Transportation, Assignment, and CPM/PERT techniques. Analytic techniques and computer packages can be used to solve problems facing business managers in decision environments**.**

Course Outcomes:

CO1: Defining Operations Research and and annotating the history of OR (Understand)

CO2: Articulate the theoretical workings of the graphical, simplex and analytical methods for making effective decisions on variables to optimize the objective function.(Apply)

CO3: Evaluate the methods of Transportation Problems and Assignment Problems (Apply)

CO4: Apply the knowledge of basic PERT and CPM and simplify the network using reduction techniques (Apply)

CO5: Identify appropriate methods for application of optimization to solve Linear programming for real world applications (Apply)

Syllabus Content:

Module I **(15 Hrs)**

Operations Research: Origin and Development of OR, Objectives of OR, Modeling and types of models in OR.

Module II **(30 Hrs)**

Linear Programming: Mathematical formulation of LPP, Graphical and Simplex methods of solving LPP – Duality in Linear Programming

Module III **(25 Hrs)**

Transportation and Assignment Problems: North – West Corner Rule, Row Column and Table Minima Method – Vogel's Approximation Method. Assignment Problem, Hungarian Algorithm of Solution.

Module IV **(20 Hrs)**

Network Analysis: Drawing the Network Diagram – Analysis of Network, Calculation of Critical Path – PERT, Expected Completion Time and its Variance.

Books of Study:

1. KantiSwarup, Gupta P.K., Manmohan: Operations Research, Sultan Chand and Sons, New Delhi.
2. Gupta R.K.: Operations Research, Krishna Prakashan Mandir, Meerut.
3. Schaum's Outline Series: Operation Research.

References

1. Hadley G.: Linear Programming, Addison – Wesley.
2. Gupta and Manmohan: Linear Programming, Sultan Chand & Sons, New Delhi.
3. Taha: Operations Research, Macmillian.
4. Goel& Mittal: Operations Research, Pragati Prakashan, Meerut.
5. V.K. Kapoor: Operations Research, Sultan Chand & Sons, New Delhi.

SEMESTER VI

CORE COURSE

CA6PRB23: SOFTWARE DEVELOPMENT LAB (MAIN PROJECT)

Credits : 4

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

Course Outcomes:

CO1: Demonstrate a sound technical knowledge of their selected project topic.(Understand)

CO2: Sketch problem identification, formulation and solution.(Create)

CO3: Apply software application packages as an engineering tool, if required (Apply)

CO4: Manage Communication effectively with customers, peers, technicians and engineers (Apply)

SEMESTER VI

CORE COURSE

CA6CVB23 : COURSE VIVA

Credits : 1

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

CO 1 : To acquire knowledge and skills to face the interview panel.

CO 2 : To Equip the students with analytical and evaluation abilities to to respond to impromptu questions by the panel members.

CO 3 : To make the students to face the expert panel and present the knowledge, skills and problems in the most efficient way.

Course Structure :

The comprehensive viva voce examination should be based on the theoretical knowledge, skills and the practices which the students have undergone in the period of two years. It is based on all the courses the students have studied, the political, social and economic developments in the country and around the world.

SYLLABI
FOR
OPEN COURSES

SEMESTER V

OPEN COURSE

CA5D01AB23: COMPUTER FUNDAMENTALS, INTERNET & MS OFFICE

Credits : 3

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

Course Overview and Context:

Introduction to the basics of digital systems and their design; the analysis of digital circuits using Boolean Algebra and logic reduction; concepts of memory systems and examination of the various designs, flip-flops, counters. Introduction to memory systems, micro-processors and computer architecture. This is a core course for the students to gain more insights to the actual working principles of computing systems.

Course Outcomes:

CO1: Describe the fundamentals and classifications of computers (Understand)

CO2: Explain the terms associated with Internet and working of Internet (Understand)

CO3: Outline the salient features of word processing and documentation with special reference to MS Word (Understand)

CO4: Discuss the features and applications of Spreadsheet with reference to MS Excel and MS Powerpoint (Understand)

Syllabus Content:

Module I: **(12 Hrs.)**

Computer Fundamentals: History, Generations, Classifications, Operating Systems, Types of Networks.

Module II **(15 Hrs.)**

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

Module III **(15 Hrs.)**

Word Processing: Introduction, Microsoft Word, Basic Menus, Formatting the text & paragraph, Working with Index

Module IV **(15 Hrs.)**

Spreadsheet: Introduction, Microsoft Excel, Basic Menus, Formulas, Basic functions, Charts and Graphs.

Module V **(15 Hrs.)**

Microsoft PowerPoint: Introduction, Basic Menus, Template, Slide Basics, Charts, Adding Multimedia & Animation.

Books of study:

1. Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill
2. P K Sinha & Priti Sinha - Computer Fundamentals, Fourth Edition, BPB Publications.
3. M Morris Mano-Digital Logic and Computer design, Fourth Edition, Prentice Hall.

References:

1. Thomas C Bartee- Digital computer Fundamentals, Sixth Edition, TATA McGraw Hill Edition
2. Thomas L Floyd- Digital Fundamentals, Ninth edition, PEARSON Prentice Hall.
3. Malvino & Leach- Digital Principles and Applications, Sixth Edition, Tata McGraw Hill, 2006

SEMESTER V

CA5D01BB23: INFORMATICS AND CYBER ETHICS

Credits : 3

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

Course Outcomes:

CO1: Describe the Fundamentals and Classifications of Network Communication (Understand)

CO2: Explain the basic working of Internet and its main services. (Understand)

CO3: Explain the aspects of Cyber Crime and ethics and discuss the secure use of computers (Understand)

CO4: Discuss the causes, symptoms and prevention of cyber addiction. (Understand)

Syllabus 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 : **(15 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, BRNET.

Module III : **(15 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 : **(15 Hrs.)**

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

Module V: **(15 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.

Books of study:

1. Alan Evans, Kendall Martin, Mary Anne Poatsy – "Technology in Action ", Pearson

References:

2. Dinesh Maidasani, "Learning Computer Fundamentals, MSOffice and Internet & Web Technology", Firewall Media , Lakshmi Publications.

SYLLABI
FOR
CHOICE BASED
CORE COURSES

SEMESTER VI

ELECTIVE

CA6C12AB23: SOFT COMPUTING TECHNIQUES

Credits : 4

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

Course Overview and Context:

1. To apply the soft computing techniques for solving the problem of civil engineering.
2. To learn fuzzy logic and applications in civil engineering
3. To solve single-objective optimization and its applications using GAs.
4. To understand the Artificial neural network and its applications.

This orients the students towards the analysis and design of intelligent systems.

Course Outcomes:

CO1: Explain soft computing techniques and their applications.(Understand)

CO2: Analyze various neural network architectures. (Analyze)

CO3: Interpret Fuzzy systems and its operations. (Understand)

CO4: Illustrate the genetic algorithm concepts and their applications.(Understand)

CO5: Identify a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution. (Apply)

Syllabus Content:

Module I: **(18 Hrs)**

Soft Computing, Difference between soft computing and hard computing. Neural Networks: Basic concepts of Neural Networks, Human Brain, Artificial Neuron model, Activation functions, Neural network architecture, Single layer and multilayer feed forward networks, Recurrent networks, Neural network characteristics, Learning methods, Rosenblatt‟s perceptron, Perceptron and linearly separable tasks, XOR problem, Neural network applications.

Module II: **(18 Hrs)**

Back Propagation Networks: Architecture- perceptron model, solution, single layer artificial neural network, multilayer perception model, back propagation learning- input layer computation, hidden layer computation, output layer computation, calculation of error, Training of neural network, effect of learning rate coefficient, Back propagation algorithm.

Module III: **(18 Hrs)**

Fuzzy Set Theory: Fuzzy versus crisp, Crisp sets, Operations on crisp sets, Properties of crisp sets, Partition and covering, Fuzzy sets, Membership functions, Basic fuzzy set operations, Properties of fuzzy sets, Crisp relations, Operations on crisp relations, Fuzzy relations, Fuzzy cartesian product, Operations on fuzzy relations.

Module IV: **(18 Hrs)**

Fuzzy Systems: Crisp logic, Laws of propositional logic, Inference in propositional logic, Predicate logic, Interpretations of predicate logic formula, Inference in predicate logic, Fuzzy logic, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy inference, Fuzzy rule based system, Defuzzification methods, Applications.

Module V: **(18 Hrs)**

Genetic Algorithm: History, Basic concepts, Biological background, Creation of offsprings, Encoding, Fitness function, Reproduction, Genetic Modeling: Crossover, Inversion and deletion, Mutation, Bit-wise operators used in genetic algorithm, Generational cycle, Convergence of a genetic algorithm, Issues and benefits of GA, Application domains.

Book of study:

1. S. Rajasekaran and G.A Vijayalakshmi Pai- Neural Networks, Fuzzy Logic, and Genetic AlgorithmsSynthesis and Applications, Prentice-Hall of India Pvt.Ltd ,2004.

References:

1. S. N. Sivanandan and S. N. Deepa, Principles of Soft Computing, Wiley India 2nd Ed, 2011.
2. B K Tripathy, J. Anuradha, Soft computing Advances and Applications, Cengage Learning.
3. B Yegnanarayana, Prentice, Artificial Neural Network, Hall of India Pvt.Ltd , 2012.

SEMESTER VI

ELECTIVE

CA6C12BB23: DATA MINING

Credits : 4

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

Course Overview and Context:

Upon successful completion of the course the student will:

- Be able to understand the concepts, strategies, and methodologies related to the design and construction of data mining
- Be able to comprehend several data preprocessing methods
- Be able to utilize data warehouses and OLAP for data mining and knowledge discovery activities
- Be able to determine an appropriate mining strategy for given large dataset
- Be able to apply appropriate mining techniques to extract unexpected patterns and new rules that are "hidden" in large databases
- Be able to obtain knowledge of current data mining application

Course Outcomes:

CO1: Illustrate the key process of Data mining and Warehousing (Understand)

CO2: Discover appropriate techniques to convert raw data into suitable format for practical data mining tasks (Apply)

CO3: Analyze and compare various classification algorithms and apply in appropriate domain (Analyze)

CO4: Evaluate the performance of various classification methods using performance metrics (Analyze)

CO5: Devise various tools of Data Mining and their techniques to solve the real time problems (Create)

Syllabus Content:

Module I: **(18 Hrs)**

Introduction Data Mining, Data WareHouse, Transactional Databases, Data Mining Functionalities Characterization and Discrimination, Mining frequent patterns, Association and correlation, Classification and Prediction, Cluster Analysis, Classification of Data Mining

Systems, Data Mining Task Primitive, Integration of Data Mining systems, Major issues in Data Mining, Data integration and transformation, Data reduction, Data discretization.

Module II : **(18 Hrs)**

Data Warehouse and OLAP technology Data Warehouse, Multidimensional data Model, Data warehouse architecture, Data Warehouse implementation, OLAP, Data Warehouse and data mining.

Module III: **(18 Hrs)**

Association Rules and Classification Concepts Efficient and Scalable Frequent itemset Mining methods, Mining various kind of association rules, from association mining to Correlation analysis, Classification and prediction, Issues, Classification by Decision tree induction, Bayesian Classification, Rule-based classification, Support Vector Machines, Learning from your neighbors, Prediction.

Module IV: **(18 Hrs)**

Cluster Analysis Definition, Types of data in cluster analysis, A categorization major Clustering methods- Partitioning methods, K-means and k-medoids, from k-medoids to CLARANS, Hierarchical methods, Density based methods.

Module V: **(18 Hrs)**

Mining Complex Data Spatial Data Mining, Multimedia Data Mining, Text Mining and Mining WWW

Book of study:

1. Jiawei Han and Micheline Kamber - Data Mining - Concepts and Techniques, Second
   Edition, Elsevier, 2006

Reference:

1. Witten and Frank - Data Mining Practical Machine Learning Tools and Techniques, Second

SEMESTER VI

ELECTIVE

CA6C12DB23: CLOUD COMPUTING

Credits : 4

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

Course Outcomes:

CO1: Associate the theoretical background for computing and storage clouds working environments.(Understand)

CO2: Deduce the methodologies and technologies for the development of applications that will be deployed and offered through cloud computing environments. (Analyze)

CO3: Summarise Virtualization management and virtualization technologies in cloud computing. (Understand)

CO4: Establish the Implementation and management of cloud security and the various risk models in security. (Apply)

CO5: Summarize Market based management and third-party cloud services. (Evaluate)

Syllabus Content:

Module I: **(18 Hrs)**

Introduction: Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments Applications Satellite Image Processing ,Social networking.

Module II: **(18 Hrs)**

Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management.

Module III: **(18 Hrs)**

Cloud Management & Virtualization Technology: Virtualization: Fundamental concepts of compute, storage, networking, desktop and application virtualization. Virtualization benefits, server virtualization, Block and file level storage virtualization.

Module IV: **(18 Hrs)**

Cloud Security: Security risks in cloud, security attacks in virtualization, security solutions in virtualization, securing the cloud, security boundary, CSA cloud reference model with security mechanisms, encryption, establishing identity and presence.

Module V: **(18 Hrs)**

Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, and Third Party Cloud Services.

Book of Study

1. Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub

References

1. Kumar Saurabh, "Cloud Computing" , Wiley Pub
2. Krutz , Vines, "Cloud Security " , Wiley Pub
3. Velte, "Cloud Computing A Practical Approach" ,TMH Pub

SEMESTER VI

ELECTIVE

CA6C12DB23 DIGITAL IMAGE PROCESSING

Credits **: 4**

Hours per week **: 5**

Total Lecture Hours **: 90**

Course Outcomes:

CO1: Review the fundamental concepts of a digital image processing system.(Understand)

CO2: Analyze images in the frequency domain using various transforms(Analyze)

CO3: Evaluate the techniques for image enhancement and image restoration.(Analyze)

CO4: Categorize various compression techniques.(Analyze)

CO5 : Interpret image segmentation and representation techniques.(Understand)

Syllabus Content:

Module I: **(18 Hrs.)**

Digital Image Fundamentals Image, Digital Image, Digital image processing-definitions, Examples of fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Image processing system.

Module II : **(18 Hrs.)**

Elements of visual perception Elements of visual perception- Image Formation, Brightness adaptation and Discrimination, Image sampling and quantization- basic concepts, spatial and Intensity resolution, Basic relationship among Pixels.

Module III: **(18 Hrs.)**

Image Enhancement in Spatial and Frequency Domain Intensity Transformation and spatial Filtering Basics, Intensity transformation functionsImage Negatives, Log Transformations, Power Law Transformations, Histogram Processing, Spatial filtering- correlation and convolution; Fourier transform and frequency domain.

Module IV: **(18 Hrs)**

Morphological Image Processing Introduction, basis of set theory, Dilation, Erosion, Structuring elements, Opening and Closing, Hit or miss transformation.

Module V: **(18 Hrs.)**

Image Segmentation Point, Line, Edge detection-detection of isolated points, Basic edge detection-Gradient operators; Pixel based approach-Basics of intensity thresholding, Basic global thresholding; Region based segmentation- region growing, region splitting and merging.

Book of Study:

1. Rafael C. Gonzalez, Richard E. Words- Digital Image Processing, Third edition, Pearson.

References:

1. Anil K Jain- Fundamentals of Digital Image Processing , Pearson Education.
Er. Rishabh Anand, Digital Image Processing, MEDTEC Publications