P.K.R. ARTS COLLEGE FOR WOMEN

(Re-Accredited with 'A' Grade by NAAC)

Autonomous Institution-Affiliated to Bharathiar University

Gobichettipalayam-638 476

DEPARTMENT OF MATHEMATICS

BACHELOR OF SCIENCE IN MATHEMATICS

SYLLABUS

SCHOLASTIC COURSES
AND
CO-SCHOLASTIC COURSES

For all the candidates admitted from the Academic Year

2025-2026 and onwards

Under CBCS PATTERN

CONTENTS

P.K.R. ARTS COLLEGE FOR WOMEN
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Autonomous Institution - affiliated to Bharathiar University
No: 21, Pariyur Road, Gobichettipalayam-638 476.

MEETING OF BOARD OF STUDIES IN MATHEMATICS
Academic year 2025 – 2026
PROGRAMME: B.Sc. Mathematics

Date: 25.04.2025   **Time:10.00 am**

Agenda

1. Confirm the minutes of the eighth meeting of the board of Studies held on 27.04.2024.

2. Approve the action taken on the resolutions passed in the previous meeting of the Board of Studies held on 27.04.2024 and the Eighth meeting of the academic council held on 08.05.2024.

3. Approve the new rules and regulations for the students admitted in UG programme from the academic year 2025-2026 & onwards.

4. Approve the Programme Structure, Programme Scheme, Scheme of Examinations, Question paper pattern and knowledge level in OBE pattern for the students admitted in UG Programme from the academic year 2025-2026 & onwards.

5. Ratify the Removal/Inclusion/ Modification/Introduction in the Programme Structure, Programme Scheme and in the Scheme of Examinations (if any) (along with the Mapping of CO'S and PO'S Statements) for the students admitted in the UG Programme in the academic years 2023-2024, 2024-2025.

6. Consider and Recommend the revision of the minor changes such as shifting of courses and Modifications in the syllabus in UG Programme.

7. Recommend Fresh panel of Examiners for QP Setting/ Practical Examinations/ Project Viva- Voce / Central Valuation for UG Programme.

8. Any other matter.

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DEPARTMENT OF MATHEMATICS

MEMBERS IN BOARD OF STUDIES

Academic Year: 2025-2026

S.No	CATEGORIES	NAME & DESIGNATION	SIGNATURE
1	Chairperson	Ms.R.Jayalakshmi, Head, Department of Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9486640983 Mail ID : jaipranikaa@gmail.com	
2	University Nominee	Dr.K.K.Mythili, Associate Professor and Head, Department of Mathematics CA, Vellalar College for Women(AUTONOMOUS), Thindal, Erode -12. Mobile : 9443523525 Mail ID: mathsmyth@gmail.com	
3	Subject Expert-1	Dr. A.K.Abdul Hakeem, Associate Professor, Department of Mathematics, Sri Ramakrishna Mission Vidhyalaya College of Arts and Science, Coimbatore – 641 048. Mobile: 9442401998, 9486078612 Mail ID: drabdulmaths@gmail.com	

4	Subject Expert-2	Dr.P.Karthikeyan, Assistant Professor, Department of Mathematics, Sri Vasavi College, Erode – 638 316. Mobile: 6381777633. E – mail ID: pkarthisvc@gmail.com	
5	Industry Representative	Ms.A.C.Uvashalini, PeopleSoft Associate, Kovaion Consulting Private Ltd, Bangalore. Mobile: 9790352523 Mail ID: uvamaths19@gmail.com	
6	PG Meritorious Alumnus	Dr. B.Usha, Assistant Professor(Sr.G), Department of Mathematics, Kongu Engineering College, Perundurai - 638060. Mobile: 9965013796 Mail ID: usha_b.sh@kongu.edu	
7	Ex Officio Member	Ms. S.A.Dhanalakshmi, Controller of Examinations, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile:9842420006 Mail ID:dhanagobu@gmail.com	
8	Member-1	Dr. M.Kasthuri, Associate Professor and Head, Department of Mathematics, P.K.R. Arts College for Women, Gobichettipalayam - – 638476. Mobile : 9443951244 Mail ID:joevarshini@gmail.com	

9	Member-2	Ms. L.Priya, Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9994048302 Mail ID: priya1@pkrarts.org	
10	Member-3	Ms. A.Poornima, Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9894199372 Mail ID:poornima.mphil@gmail.com	
11	Member-4	Ms. S.Mayuri Assistant Professor in Mathematics, P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 7708897235 Mail ID:mayuris@pkrarts.org	
12	Present Student Member	Ms.K.Elamathi I M.Sc Mathematics P.K.R. Arts College for Women, Gobichettipalayam – 638476. Mobile: 9578164050 Mail ID: elamathi816@gmail.com	

VISION AND MISSION OF THE COLLEGE

VISION

To make a centre of excellence in higher education by imparting value based quality education to rural women, to empower and make them economically independent, and socially committed to the task of building a strong nation.

MISSION

Empowering the rural women by inculcating the core values of truth and righteousness and by ensuring quality in the teaching-learning process along with co-curricular and extra-curricular activities for their economic independence, social commitment and national development.

GOALS AND OBJECTIVES

- The college had been founded by the tillers of the soil, aimed at providing access to higher education for women students of the rural areas, who do not have the facilities of their urban counterparts.
- To provide quality education to empower the rural women.
- To impart value based education and prepare the women students to uphold the rich cultural heritage and secular ideals of the nation.
- To awaken the social consciousness among students and motivate them to serve society with the motive of establishing an egalitarian system.
- To provide opportunities to develop the overall personality of the students and thus enabling them to face challenges in the competitive global scenario.

CORE VALUES OF THE INSTITUTION

- Education
- Enlightenment
- Discipline
- Service

RULES AND REGULATIONS FOR THE STUDENTS

ADMITTED FROM 2025 – 2026 AND ONWARDS

RULES AND REGULATIONS FOR STUDENTS ADMITTED IN UG PROGRAMMES

FROM 2025 - 2026 & ONWARDS

P.K.R. Arts College founded in the year 1994 with the vision to make the college a "**Centre of Excellence"** in higher education by imparting value based quality education to rural women, to empower and make them economically independent and socially committed to the task of building a strong nation. Ever since its inception the college took steps to inculcate the core values of truth and righteousness through right kind of teaching and learning methods and grown to leap and bounds.

As per the expectations of UGC on the Autonomous colleges, our college has initiated the following measures for the quality improvement of its functioning:

1. To Re-structure and design the course curricula;
2. To Inculcate research culture amongst the students and teachers;
3. Promote healthy practices such as community service, extension services, projects, etc. for the benefit of the society

As an Autonomous Institution P.K.R. Arts College for Women follows the UGC, TANSCHE and BHARATHIAR UNIVERSITY guidelines of CBCS pattern in framing Programme Structure & Programme Scheme and Scheme of Examinations for the students admitted in various UG Programmes from the Academic year 2017-18 and Onwards.

DEFINITION OF TERMS:

Choice Based Credit System (CBCS):

CBCS is a flexible system of learning that permits students to

- Learn at their own pace,
- Choose electives from a wide range of elective courses offered by the departments
- Adopt an inter-disciplinary approach in learning, and
- Undergo additional courses and acquire more than the required number of credits
- Make best use of the expertise of available faculty

Programme:

The term *"Programme"* is used to refer to the Bachelor level of study offered in P.K.R. Arts College for Women. For e.g. B.A. Programme indicates Bachelor of Arts and B.Sc., Programme indicates, Bachelor of Science.

Branch:

The term *"branch"* is used to refer to the subject specialization under the Bachelors Level of study offered in P.K.R. Arts College for Women. For e.g. B.A. Tamil Literature indicates, the Bachelor of Arts, specializing Tamil Literature.

Duration:

The total study periods of various programmes are:

Undergraduate (Bachelors) programmes : (B.A. or B. Sc or B.Com or BCA or BBA): Three years (Six semesters)

Curriculum:

The term "curriculum" indicates the various components of the programme and branch of study.

Course:

The term "course" is used to refer to the specific subject of the particular Programme and branch of study.

Programme Scheme:

Programme scheme denotes the course outline or the components of the particular Programme and branch of study.

Scheme of examinations:

Scheme of examination indicates the contact hours allotted for each course, the duration of End Semester Examination, marks details for CIA and ESE and the credit score specified for each course.

Syllabus: The subject content of each course is referred to as "Syllabus".

Semester:

The term "semester" denotes the start and the end of teaching period of the Academic year. The college adopts two semester pattern of an Academic Year. The duration of each semester is roughly around six months period but not less than 90 working days. The semester is subdivided as (ODD and EVEN) spanning six months (odd semester is from June to November and Even semester is from December to May).

Credit system:

It is a system of assigning weightage to each one of the courses and components of the curriculum of a programme and branch of study in terms of the weightage of the teaching learning process of that particular course. The weightage is given in terms of credit points.

Credit point:

Credit point is the numerical weightage given to the particular course of study. The student learner should obtain the mandatory minimum credit points specified for each programme and branch of study to earn the degree. The student learner may also earn additional credits by the way of completing extra courses (subjects).

Programmes offered:

- B.A (Tamil Literature)
- B.A (English Literature)
- B.Sc (Mathematics)
- B.Sc (Physics)
- B.Sc (Computer Science)
- B.C.A (Computer Application)
- B.Sc (Information Technology)
- B.Sc (Artificial Intelligence & Machine Learning)
- B.Sc (Cyber Security)
- B.Com (Commerce)
- B.Com (Computer Applications)
- B.Com (Professional Accounting)
- B.Com (Information Technology)
- B.B.A (Business Administration)

Credits to be earned:

All UG Programmes : **140** credits

Duration:

Duration for all the UG programmes: THREE (03) years.

COMPONENTS FOR UG PROGRAMMES:

Scholastic Courses:

Part I: Tamil/Hindi/French/Malayalam/Kannada/Sanskrit

Part II: English

Part III: This part consists of…

1) Core courses (Theory / Practical / Institutional Training / Industrial Training /Apprenticeship Training / Mini Project, Project Work & Viva Voce)

2) Core: Allied courses (Core Allied / Core Allied Practical)

3) Elective courses

(CBCS - Discipline Specific Elective courses / Open Elective Course)

Part IV: Following are the components coming under Part: IV

A. Foundation:

i) Environmental studies - offered during semester I

ii) <mark>Health and Wellness</mark> - offered during semester II

B. Skill Enhancement:

i) Courses offered by the respective departments IV, V & VI

C. Ability Enhancement:

Course I: Information Security - offered during semester III

Course II: Consumer Rights - offered during semester IV

D. Non-Major Electives:

i) Indian Women and Society / Advanced Tamil - offered during semester III

Part V : Following are the components coming under Part: V

i) Proficiency Enhancement:

Self Study - offered during semester V

ii) Competency Enhancement :

There are 3 components

a) NSS / YRC / RRC / CCC / PHYSICAL EDUCATION / OTHERS - to be completed during Semester I – VI by the candidate.

b) Professional Grooming (Life Skills) - to be completed during Semester I – IV by the candidate.

c) Students Social activity (Curriculum related) - to be completed during Semester I – VI by the candidate.

ADMISSION NORMS:

The eligibility conditions and the guidelines issued by the Bharathiar University in admitting students are followed for all the UG Programmes offered in P.K.R. Arts College for Women.

EXAMINATION AND EVALUATIONS:

Requirement for appearing End Semester Examinations:

Attendance: (as per the norms and guidelines of Bharathiar University)

i) A candidate is eligible to appear for the End Semester examinations in any semester, if:

- She secures not less than 75% of attendance in the number of working days during the semester.

- Her progress has been satisfactory

- Her conduct has been satisfactory

ii) Candidates who earn attendance between 65% and 75% are ineligible to appear for the current semester examinations. However, the Principal may condone the lack of attendance of those students on the following grounds and permit them to write End Semester Examinations, after the payment of condonation fee:

∗ Prolonged illness

∗ Major Surgery

∗ Accident which demands a long rest

The cause of the long period of absence should be informed with supportive documents to the Principal within a week's time and get the leave sanctioned.

iii) Candidates who earn attendance between 55% and 64% are ineligible to appear for the current semester examinations. However, they can write arrear subjects, if any. They are permitted to continue their studies in the next semester; while continuing in the next semester, they have to compensate and earn combined attendance of 75% or more by taking the average of the attendance earned in the current and the previous semester.

iv) Candidates who earn attendance below 55% are not eligible to appear for the current semester examinations and also have to discontinue the course and rejoin in the same semester in the next academic year, if vacancy is available, with proper approval from the Principal through the Head of the Department concerned. These candidates are eligible to write arrear courses, if any.

v) Students having a minimum of 75% of attendance in the Practical classes alone will be eligible to submit their record note books and appear for CIA and ESE practical examinations.

vi) Students shall be permitted to appear for the practical examinations only with the submissions of bonafide records.

Scheme of examinations:

i) All End Semester Examinations (theory and practical) shall be conducted twice a year, in November / December and in April / May. All failed candidates shall be governed by the regulations and syllabus in force at the time of their subsequent appearances.

ii) Supplementary End Semester Examinations in VI Semester for students who have failed in only one subject from I to VI semester are conducted in June / July every year to facilitate the final year students who have failed to score passing minimum to go for higher studies or seek job early.

RULES TO BE FOLLOWED BY STUDENTS DURING EXAMINATION:

1. A candidate entering the examination hall must possess hall-ticket and identity card issued by the Principal; else she will be denied admission to write the examination.

2. Candidates have to occupy their allotted seats 10 minutes before the commencement of examination and maintain discipline and silence inside the examination hall. They have to give due attention to the instructions given by the Hall Superintendent before the commencement and also during the examination.

3. No candidate will be permitted to enter examination hall after 30 minutes from the commencement of examination. Similarly, no candidate will be permitted to leave the exam hall before 30 minutes from the commencement of examination.

4. A candidate who leaves the examination hall will not be permitted to re-enter the hall under any account.

5. Candidates are expected to bring their own pens, pencils, eraser, geometrical instruments, non-programmable calculators etc., and will not be allowed to borrow from others.

6. Candidates should use only blue or black ink or ball-point pen while answering their papers. Only for drawing diagrams or chart, colour pens / sketch pens are allowed.

7. Clark's mathematical table, Statistical table and Compound present value table will be supplied to candidates on request and the same should be returned immediately after use, without any scribbling. However, the candidates will be allowed to use their own mathematical and statistical tables / data sheets/graph sheets which are uncommon and specifically required to answer a particular paper after obtaining permission from Chief/Hall Superintendent. Such sheets or tables with any scribbling will not be permitted.

8. Candidates are prohibited from possessing study material in any form or mobile phone or and any such Electronics/ Communication instruments inside the examination hall. Mere possession of such materials inside the examination hall itself will be considered as the material meant for malpractice and will lead to disciplinary actions.

9. Candidates must verify and satisfy themselves that they have received correct question paper before they start answering for questions. Question paper not relevant should be returned to the hall superintendent at once.

10. Candidates are not allowed to write beyond the time prescribed for the examinations.

11. Rough work, if any, must be done by the candidates on the bottom of the page itself. Candidates can reserve, if necessary, one fourth of the page at the bottom exclusively for the purpose. No separate answer book for rough work will be supplied to candidates. Rough work carried out of by a candidate will become part and partial of the answer paper.

12. Candidates are forbidden from asking questions or clarifications of any kind from the fellow student or Hall Superintendent during the examination.

13. Candidates should not detach any sheet from the main answer book or smuggle out additional sheet or main book.

14. Candidates should handover the answer books personally to the Hall superintendent, before leaving the examination hall.

15. Candidates should not write their Register number anywhere else (except in the specified space) on the first page of Answer Book. Writing the name or making any appeal in the answer book or any other identifiable marking will be treated as an attempt to influence the examiner. Hence, any such act will attract disciplinary measures.

16. The students who indulge in any malpractice while writing examination will be immediately referred to the Chief Superintendent for the initiation of appropriate disciplinary action.

17. In case of impersonation, the accused will be handed over to police authorities for investigation and necessary action.

18. In the event of public holiday being declared after the publication of timetable, the examinations will not be postponed or cancelled. The examinations will be conducted as scheduled unless otherwise notified.

19. Any letter or telegram or phone call to a candidate shall not in any case be delivered / informed to the candidate until he/she completes examination.

20. Candidates with disabilities and who could not write examination by themselves shall submit a request to the Principal in the beginning of the Academic Year with the support of documentary evidences for alternate arrangements.

Transitory positions:

The candidate who have completed the course of study (THREE YEARS IN CASE OF UG PROGRAMMES) but have arrears will be permitted to take up the examinations only under the regulations in force at the time.

Facility to appear in an examination already passed:

The Candidates who have passed examinations may be permitted to appear again (Only once) for the end semester examinations of that course or courses under the regulations and syllabi in force then, with a view to improve their performance(s). If they do not show improvement, their previous marks shall be the final marks in all records (such candidates should not have applied for

their Degree certificate in Convocations held in between). Also such reappearances shall be permitted only once at the examination(s) conducted in the college in the next two semesters only.

Provision to re-total the answer book:

Candidates who desire to have their answer books re-totaled shall apply to the controller of Examinations, remitting the prescribed fees within 10 calendar days from the date of publication of results. Where the marks obtained in the re-totaling are higher than the marks awarded earlier, the Controller of Examinations shall issue the revised mark sheets after withdrawing the previous one.

Provision to appeal for re-evaluation of End Semester Examination Marks:

Candidates who desire to have their answer books revalued shall apply to the Controller of Examinations, remitting the prescribed fees within 10 calendar days from the date of publication of results (The date mentioned in the Mark sheet). If the revalued marks are higher to the extent of getting a passing minimum and more than the marks awarded earlier, then the COE shall issue the revised mark sheet after withdrawing the mark sheet issued previously. If the revalued marks are higher than the marks awarded earlier but not to the extent of getting a passing minimum, then the first valuation marks shall be the final marks. The principles of moderation formulated in the Results Passing Board for the respective examination shall be applied for the revaluation cases also.

Transparency system:

Under this system, the photo copy of the answer script written by the student is issued on request. The procedure is that the candidate who desires to get the Photo copy of her answer script shall apply to the COE, remitting the prescribed fee within 10 calendar days from the date (noted in the mark sheet) of publication of results. On a specific day, the candidates who have applied for this facility will be given with the photo copy of the answer script and would be directed to discuss the issues with the subject experts who are specially appointed for the purpose. The students may scrutinize the answers script, discuss with the subject expert, get clarifications and if they are not convinced with the marks awarded then they may go for applying for revaluation. Such a request shall be made within 3 calendar days. The procedure followed for the revaluation is applied to this category also.

Passing Minimum:

A candidate who secures not less than 40% marks in ESE of various components shall be declared to have passed the examination in that course (subject).

Classification of successful candidates and grading system:

No candidate shall be eligible for classification or grading unless, the candidate

- has undergone the prescribed course of study for the prescribed period
- has passed / completed all the courses (subjects) / components prescribed for the programme
- Has earned the credit points prescribed for the programme.

Part I & II:

Candidates who have passed Part: I (Tamil / Hindi / French / Kannada / Malayalam / Sanskrit) and Part: II English Courses (subjects) and securing 60% and above and 50% to 59.99% within three years from the date of admission, shall be declared to have passed in I & II classes respectively and all other successful candidates shall be declared to have passed the examinations in III class.

Part III:

Candidates who have passed all the Part: III examinations in FIRST ATTEMPT within the study period of the respective semester and securing 75% and above in aggregate of Part: III shall be declared to have passed the Part: III examination in first class with distinction. All other candidates who have passed Part: III subjects and securing 60% & above, 50% to 59.9% and 40% to 49.9% shall be declared to have passed the Part: III examinations in First, Second and Third class respectively.

GRADING SYSTEM

Based on the guidelines of Bharathiar University on grading system the following grading System for the students admitted from 2017-18 & onwards.

Conversion of Marks to Grade Points and Letter Grade:

RANGE OF MARKS	GRADE POINT	LETTER GRADE	DESCRIPTION
90 - 100	9.0 -10.0	O	Outstanding
80 - 89	8.0 – 8.9	D+	Excellent
75 - 79	7.5 – 7.9	D	Distinction
70 - 74	7.0 – 7.4	A+	Very Good
60 - 69	6.0 – 6.9	A	Good
50 - 59	5.0 – 5.9	B	Average
40 - 49	4.0 – 4.9	C	Satisfactory
00-39	0.0	U	Reappear
Absent	0.0	AAA	Absent

Classification:

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5 – 10.0	O+	First class – Exemplary*
9.0 and above but below 9.5	O	First class – Exemplary*
8.5 and above but below 9.0	D++	First class with Distinction
8.0 and above but below 8.5	D+	First class with Distinction
7.5 and above but below 8.0	D	First class with Distinction
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	First Class
6.0 and above but below 6.5	A	First Class
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	Second Class
4.5 and above but below 5.0	C+ #	Third Class
4.0 and above but below 4.5	C #	Third Class
0.0 and above but below 4.0	U	Re-appear

 # Applicable only to U.G. Programmes

* Applicable for the students who have passed the Part III examinations in FIRST APPEARANCE within the study period of the respective semesters.

- Cumulative Grade Point Average (CGPA) and final classifications are to be made for the students who have passed all courses (subjects) / completed all components prescribed for the programme

- Part-III components alone are considered for CGPA.

- Part-I, Part-II, Part-IV & Part-V are not to be considered for finding the CGPA or for the classification of Part—III .

- The maximum marks per course (subject) are to be fixed at 100.

   (if it is less or more than 100, it should be converted to 100)

- Grade point average – For a semester: (GPA): = $\sum \textbf{CGP / C}$.

    Where   C = Credits earned for the course in any semester

      G = Grade Point obtained for the course in any semester

$$GPA = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses in a semester}}$$

- Cumulative Grade Point Average – For the entire programme: (CGPA) is calculated by using the formula:

$$CGPA = \frac{\sum \textbf{CGP}}{\sum \textbf{C}}$$ Where C = Credit Point, GP= Grade Point

$$\textbf{CGPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

- **CGPA is given only in consolidated mark statement / Grade sheet.**

Ranking:

- Candidates who have passed all the courses (subjects) or completed all the components prescribed for the UG programme within the period of study are only eligible for Ranking

- Ranking is based on the marks scored in Part-III subjects only.

- Candidates passing the Part-III subjects in First Attempt within the study period of respective semesters are only eligible for ranking.

- In case of Reappearance, the first appearance mark is only considered for ranking.

- Candidates absenting for the courses (subjects) prescribed in Part-III and getting higher marks in the subsequent appearances will not be considered for Ranking.

MALPRACTICE AND PUNISHMENT
Punishment for malpractice committed during End Semester Examinations.

The students, who indulge in any malpractice, while writing examination, will be directed to report to Chief Superintendent. The chief superintendent will review and forward the case to Controller of Examinations and the CoE in turn will submit the details to Examination Committee for the initiation of appropriate disciplinary proceedings.

NATURE OF MALPRACTICE	NATURE OF PUNISHMENT	LEVEL OF PUNISHMENT
Making an appeal in any form inside the answer script	**Warning** may be given and if repeated the examination taken by the candidate will be cancelled	LEVEL: I
Possession of mobile phone / study materials / incriminating materials in any form	The **particular examination** taken by the candidate will be **cancelled**	LEVEL: II
Aiding / Passing / Referring / Copying from mobile phone / study material	The **particular examination** and a**ll t**he **examinations** written already in this semester including Arrear will be **cancelled and** may be permitted to write subsequent semester examinations	LEVEL: III
Insubordinate behavior or threatening the Invigilator	The **particular examination** and a**ll t**he **examinations** written already in this semester will be **cancelled** and also will be **debarred** from appearing for the **ONE subsequent semester examinations**	LEVEL:IV
Inserting previously written answers	The **particular examination** and a**ll t**he **examinations** written already in this semester will be **cancelled** and also will be **debarred** from appearing for the **TWO subsequent semester examinations**	LEVEL: V
Case of **Impersonation**	The **particular examination** and a**ll t**he **examinations** written already in this semester will be **cancelled** and will be **expelled From the college and the matter will be referred to the Police if necessary for further action.**	LEVEL: VI

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VISION AND MISSION OF THE DEPARTMENT

VISION

Creating a congenial environment to learn mathematical designs and to use mathematical knowledge for problem solving.

MISSION

To motivate the students to upgrade their interests in contemporary mathematical techniques and to enable them to acquire the required knowledge to strengthen their analytical skills.

PROGRAMME EDUCATIONAL OBJECTIVES

1. To provide value-based quality education with theoretical and applied skills for rural women.

2. To facilitate personality development opportunities for students to face life's challenges in today's competitive scenario.

3. To empower rural women and make them economically independent through employability and entrepreneurship.

4. To awaken social consciousness of the students through community engagement for active contribution to the society.

5. To equip the students to become morally, ethically and socially responsible for building a strong nation.

PROGRAMME OUTCOMES

1. **Disciplinary knowledge**: Demonstrate critical and systematic proficiency about the breadth and depth of the basic and emerging trends in the arts and science streams appropriate to the programme.

2. **Communication skills**: Communicate ideas clearly and effectively through verbal and non-verbal forms to specialist and non-specialist audiences with professionalism and multi-disciplinary approach.

3. **Critical thinking, problem solving and analytical reasoning:** Apply appropriate knowledge and skills to identify, formulate, critically analyse and substantially conclude with simple solutions to problems.

4. **Research skills and reflective thinking:** Explore real-time scenarios, analyse and interpret data and information, articulate and support findings with evidences incorporating economic and business practices to reach valid conclusion.

5. **Teamwork and Leadership skills for interpersonal competence:** Ability to interact, communicate and collaborate in a trans-disciplinary context.

6. **Continuous autonomous learning and digital literacy:** Ability to find, evaluate and compose clear information for self-directed learning through conventional and digital media.

7. **Social consciousness with concern for environment**: Capability to synthesise the economic, legal, social, environment, health, safety and cultural dimensions of the society with moral and ethical reasoning and promote equity through sustainable development practices.

GRADUATE ATTRIBUTES

1. Disciplinary knowledge.

2. Communication skills.

3. Critical thinking, problem solving and analytical reasoning.

4. Research skills and reflective thinking.

5. Teamwork and Leadership skills for interpersonal competence.

6. Continuous autonomous learning and digital literacy.

7. Social consciousness with concern for environment.

PROGRAMME SPECIFIC OUTCOMES

On successful Completion of **B.Sc. Mathematics Programme**, the students would have

1. possess knowledge of fundamental and abstract concepts of Mathematics and apply them in various fields
2. express Mathematical thoughts with appropriate justifications through Mathematical logic and reasoning
3. apply analytical and logical skills to develop various Mathematical Models and solve Mathematical problems
4. exhibit the Mathematical skills and expertise in the field of research and developments
5. collaborate effectively in teams and enhanced the leadership skill.
6. solve real life problems by using mathematical techniques and become lifelong learners for their professional development
7. analyze environmental hazards and gender equity issues with social consciousness and moral ethics.

P.K.R. ARTS COLLEGE FOR WOMEN (AUTONOMOUS), GOBICHETTIPALAYAM

UG PROGRAMME STRUCTURE

(For students admitted in 2025-2026 & onwards)

B.SC MATHEMATICS – PROGRAMME STRUCTURE

B.SC MATHEMATICS – PROGRAMME STRUCTURE

P.K.R. ARTS COLLEGE FOR WOMEN (Autonomous)
Gobichettipalayam-638476

DEPARTMENT OF MATHEMATICS

Scholastic Courses: **B.SC MATHEMATICS – PROGRAMME STRUCTURE**

CBCS Pattern: 2025-2026

Category	Component	No. of Courses	Credit(s) / Course	Total Credits	Proposed Semester
Part – I	Tamil/Hindi/French/Kannada/Malayalam/ Sanskrit	4	3	12	I – IV
Part – II	English	4	3	12	I – IV
Part - III	Core Courses: (Core Theory / Core Allied Practical/ Core Allied/ Core Elective/ Open Elective)	14/ 1/ 4/ 3/ 1	62/ 3/ 16/ 11/ 2	94	I-VI/ I-II/ I-IV/ V-VI/ V
	Core Courses: Institutional Training/ Industrial Training/ Article ship Training/ Mini Project	1	1	1	To be done in Summer Vacation of Semester IV, ESE in Semester V
Part –IV	**A. Foundation Courses:** i. Environmental Studies	1	2	4	I
	ii. Health and Wellness	1	2		II
	B. Ability Enhancement Courses: i.　　Information Security	1	2		III
	ii.　　Consumer Rights	1	2	4	IV
	C. Skill Enhancement Courses: i.　　Mathematical Software - SPSS - Practical	1	2		IV
	ii.　　Data Analysis using GeoGebra- Practical	1	2	6	V
	iii.　　Latex - Practical	1	2		VI
	D. Non-Major Elective: i.　　Indian Women and Society / Advanced Tamil	1	2	2	III

Part –V	**A. Proficiency Enhancement** i. Numerical Aptitude (Self Study)	1	2		V

	B. Competency Enhancement:
	  i. NSS/YRC/RRC/CCC/PHY.EDU/OTHERS
	  ii. Professional Grooming
	  iii. Students Social Activity
		1
		
		1
		1
			1
			
			1
			1
				5	Sem I to VI
					Sem I to VI
					Sem I to VI

Total Marks : 3700   Total Credits : 140

P.K.R. ARTS COLLEGE FOR WOMEN (Autonomous),

Gobichettipalayam – 638476.
BACHELOR OF SCIENCE - MATHEMATICS
Programme Scheme and Scheme of Examinations
(For students admitted from 2025-2026 & onwards)
(For branches offering Part-I and Part-II for four semesters)

Scholastic Courses:

Category/ Part	Component	Course Code	Title of the Course	Hrs/ week	Exam hrs	CIA	ESE	Total marks	Credits
			SEMESTER - I						
Part I	Language : I	25LTU01 / 25LHU01 / 25LFU01 / 25LKU01 / 25LMU01 / 25LSU01	Tamil – I / Hindi – I / French – I / Kannada – I / Malayalam – I / Sanskrit-I	6	3	25	75	100	3
Part II	English: I	25LEU01	English - I	6	3	25	75	100	3
Part III	Core : I	25MAU01	Algebra and Trigonometry	5	3	25	75	100	4
Part III	Core : II	25MAU02	Differential Calculus	4	3	25	75	100	4
Part III	Core : III Allied : I	25MAU03	Physics - I	4	3	25	75	100	4
Part III	****	****	Physics Practical	3	-	-	-	-	-
Part IV	Foundation Course : I	25FCU01	Environmental studies	2	3	50	--	50	2
			TOTAL	**30**				**550**	**20**
			SEMESTER - II						
Part I	Language : II	25LTU02 / 25LHU02 / 25LFU02 / 25LKU02 / 25LMU02 / 25LSU02	Tamil- II / Hindi-II / French II / Kannada-II / Malayalam-II / Sanskrit-II	6	3	25	75	100	3

Part II	English : II	25LEU02	English: II	6	3	25	75	100	3
Part III	Core : IV	25MAU04	Analytical Geometry	5	3	25	75	100	4
Part III	Core : V	25MAU05	Integral Calculus	4	3	25	75	100	4
Part III	Core : VI Allied : II	25MAU06	Physics -II	4	3	25	75	100	4
Part III	Core : VII Allied Practical: I	25MAU07	Physics Practical	3	3	40	60	100	3
Part IV	Foundation Course : II	25FCU02	Health and Wellness	2	3	50	--	50	2
			TOTAL	**30**				**650**	**23**
SEMESTER - III									
Part I	Language : III	25LTU03 / 25LHU03 / 25LFU03 / 25LKU03 / 25LMU03 / 25LSU03	Tamil- III / Hindi-III / French-III / Kannada-III / Malayalam-III / Sanskrit-III	**6**	3	25	75	100	**3**
Part II	English : III	25LEU03	English: III	**6**	3	25	75	100	**3**
Part III	Core : VIII	25MAU08	Differential Equations and its Applications	5	3	25	75	100	**4**
Part III	Core : IX	25MAU09	Integral and Vector Analysis	5	3	25	75	100	**4**
Part III	Core : X Allied : III	25MAU10	Transformation Techniques	4	3	25	75	100	**4**
Part IV	Ability Enhancement : I	25AEU01	Information Security	2	3	**50**	-	50	2
Part IV	Non- Major Elective	25NMU01A / 25NMU01B	Indian Women and Society / Advanced Tamil	2	3	**50**	-	50	2
			TOTAL	**30**				**600**	**22**
SEMESTER - IV									
Part I	Language : IV	25LTU04 / 25HU04 / 25LFU04 / 25LKU04 / 25LMU04 / 25LSU04	Tamil- IV / Hindi-IV / French-IV / Kannada-IV / Malayalam-IV / Sanskrit-IV	**6**	3	25	75	100	**3**

Part II	English : IV	25LEU04	English: IV	**6**	3	25	75	100	**3**
Part III	Core : XI	25MAU11	Mechanics	5	3	25	75	100	**4**
Part III	Core : XII	25MAU12	Numerical Methods	4	3	25	75	100	**4**
Part III	Core : XIII Allied : IV	25MAU13	Mathematical Statistics	4	3	25	75	100	**4**
Part IV	Skill Enhancement : I	25SEMAU01	Mathematical Software - SPSS - Practical	3	3	50	-	50	2
Part IV	Ability Enhancement : II	25AEU02	Consumer Rights	**2**	3	**50**	-	50	**2**
			TOTAL	**30**				**600**	**22**
	SEMESTER - V								
Part III	Core : XIV	25MAU14	Abstract Algebra	6	3	25	75	100	5
Part III	Core : XV	25MAU15	Real Analysis - I	6	3	25	75	100	5
Part III	Core : XVI	25MAU16	Complex Analysis - I	6	3	25	75	100	5
Part III	Core : XVII	25MAU17A/ 25MAU17B/ 25MAU17C	Institutional Training / Industrial Training / Mini Project	-	3	100	-	100	1
Part III	Core : XVIII (Open Elective)	****	Opted by the students offered by other departments	4	3	25	75	100	2
Part III	Core : XIX Elective : I	25MAU18A/ 25MAU18B	Operations Research – I/ Mathematical Modelling - I	5	3	25	75	100	4
Part IV	Skill Enhancement : II	25SEMAU02	Data Analysis using GeoGebra - Practical	3	3	50	-	50	2
Part V	Proficiency Enhancement	25PEMAU01	Numerical Aptitude (Self Study)	--	3	--	100	100	2
			TOTAL	**30**				**750**	**26**
	SEMESTER - VI								
Part III	Core : XX	25MAU19	Linear Algebra	6	3	25	75	100	5
Part III	Core : XXI	25MAU20	Real Analysis - II	6	3	25	75	100	5
Part III	Core : XXII	25MAU21	Complex Analysis - II	6	3	25	75	100	5

Part III	Core : XXIII Elective : II	25MAU22A/ 25MAU22B	Operations Research – II/ Mathematical Modelling - II	5	3	25	75	100	4
Part III	Core : XXIV Elective : III	25MAU23A/ 25MAU23B	Graph Theory / Fuzzy Mathematics	4	3	25	75	100	3
Part IV	Skill Enhancement : III	25SEMAU03	Latex Practical	3	3	50	-	50	2
			TOTAL	**30**				**550**	**24**
Part V	Competency Enhancement		NSS/YRC/RRC/CCC/PHY.EDU/ Others	SEMESTER I – VI					1
			Professional Grooming (Life Skills)	SEMESTER I – VI					1
			Students Social activity (Related to the Curriculum)	SEMESTER I –VI					1

Total Marks: 3700 & Total credits: 140

a.) LIST OF ELECTIVE COURSES

S. No	Core Elective	Course Code	Course	Weekly Contact Hours	Credits
1	Core Elective – I	25MAU18A / 25MAU18B	Operations Research – I / Mathematical Modelling - I	5	4
2	Core Elective – II	25MAU22A / 25MAU22B	Operations Research – II / Mathematical Modelling - II	5	4
3	Core Elective – III	25MAU23A / 25MAU23B	Graph Theory / Fuzzy Mathematics	4	3

b.) LIST OF ALLIED COURSES

S. No	Course Code	Course	Weekly Contact Hours	Credits
1	25MAU03	Physics – I	4	4
2	25MAU06	Physics – II	4	4
3	25MAU07	Physics Practical	3	3
4	25MAU10	Transformation Techniques	4	4
5	24MAU13	Mathematical Statistics	4	4

c.) LIST OF SKILL BASED COURSES

S. No	Course Code	Course	Weekly Contact Hrs	Credits
1	25SEMAU01	Mathematical Software – SPSS - Practical	3	2
2	25SEMAU02	Data Analysis using GeoGebra - Practical	3	2
3	25SEMAU03	Latex - Practical	3	2

d.) LIST OF ABILITY ENHANCEMENT

S. No	Course Code	Course	Weekly Contact Hrs	Credits
1.	25AEU01	Information Security	2	2
2.	25AEU02	Consumer Rights	2	2

LIST OF NON-MAJOR ELECTIVE

S. No	Course Code	Course	Weekly Contact Hrs	Credits
1.	25NMU01A/ 25NMU01B	Indian Women and Society / Advanced Tamil	2	2

e.) LIST OF PROFICIENCY ENHANCEMENT (Self Study)

S. No	Course Code	Course	Weekly Contact Hrs	Credits
1.	25PEMAU01	Numerical Aptitude	--	2

LIST OF OPEN ELECTIVE COURSES

Course Code	Department	Course	Evaluation	Credit
25TAUOE1	Department of Tamil	jpwd; Nkk;ghl;Lf; fy;tp	Both CIA and ESE	2
25ENUOE1	Department of English	English for effective communication		
25MAUOE1	Department of Mathematics	Mathematics for Business		
25PHUOE1	Department of Physics	Physics in day to day life		
25CSUOE1	Department of Computer Science	Internet For Everyone		
25AMUOE1		Advanced Excel – Practical		
25ITUOE1		Basics of Computer Technology		
25CAUOE1		Machine Learning		
25CYUOE1		Prompt Engineering -Practical		
25CGUOE1	Department of Commerce	Basics of Accounting		
25CUOE1		E- advertising		
25CPUOE1		Human resource management		
25CIUOE1		Fundamentals of Banking		
25BAUOE1	Department of Management	Start-up Business		

f) Courses for Competency Enhancement:

Semester	Course	Hours per Week	Credit
I - VI	NSS / YRC / RRC / CCC / PHY.EDU / Others	Self-Paced with Faculty mentoring and Support	1
I - VI	Professional Grooming (Life Skills)		1
I - VI	Students Social activity (Related to the Curriculum)	Faculty mentoring and Support	1

Total Credits: 140 credits   **Total Marks: 3700**

Chair Person

Mrs. R.Jayalakshmi,
Assistant Professor & Head,
Department of Mathematics,
P.K.R. Arts College for Women,
127, Pariyur Road,
Gobichettipalayam.

SYLLABUS WAS PREPARED AND FINALISED AS MENTIONED BELOW:

Category	Component	Course Code	Course Title	Faculty name
SEMESTER - I				
Part III	Core : I	25MAU01	Algebra and Trigonometry	Mrs.A.Poornima
Part III	Core : II	25MAU02	Differential Calculus	Ms.S.Amsalekha
SEMESTER - II				
Part III	Core : IV	25MAU04	Analytical Geometry	Mrs.A.Poornima
Part III	Core : V	25MAU05	Integral Calculus	Ms.S.Amsalekha
		25MACCU1	Certificate Course – C-Programming	Mrs.S.Mayuri
SEMESTER - III				
Part III	Core : VIII	25MAU08	Differential Equations and its Applications	Mrs.R.Jayalakshmi
Part III	Core : IX	25MAU09	Integral and Vector Analysis	Ms.S.Amsalekha
Part III	Core : X Allied : III	25MAU10	Transformation Techniques	Mrs.S.Deepika
SEMESTER - IV				
Part III	Core : XI	25MAU11	Mechanics	Mrs.A.Poornima
Part III	Core : XII	25MAU12	Numerical Methods	Mrs.E.Deepika
Part III	Core : XIII Allied : IV	25MAU13	Mathematical Statistics	Mrs. P.Vidhya
Part IV	Skill Enhancement : I	25SEMAU01	Mathematical Software - SPSS - Practical	Mrs. P.Vidhya
SEMESTER - V				
Part III	Core : XIV	25MAU14	Abstract Algebra	Mrs.P.Yamunarani
Part III	Core : XV	25MAU15	Real Analysis - I	Mrs.R.Jayalakshmi
Part III	Core : XVI	25MAU16	Complex Analysis - I	Dr.M.Kasthuri
Part III	Core : XVIII (Open Elective)	***	Opted by the students offered by other	Mrs.E.Deepika

			departments (Mathematics for Business)	
Part III	Core : XIX Elective : I	25MAU18A/ 25MAU18B	Operations Research – I/ Mathematical Modelling –I	Mrs.P.Vidhya Mrs.P.Yamunarani
Part IV	Skill Enhancement : II	25SEMAU02	Data Analysis using GeoGebra- practical	Mrs.E.Deepika
Part V	Proficiency Enhancement	25PEMAU01	Numerical Aptitude (Self Study)	Mrs.S.Deepika
		SEMESTER - VI		
Part III	Core : XX	25MAU19	Linear Algebra	Mrs.P.Yamunarani
Part III	Core : XXI	25MAU20	Real Analysis - II	Mrs.R.Jayalakshmi
Part III	Core : XXII	25MAU21	Complex Analysis - II	Dr.M.Kasthuri
Part III	Core : XXIII Elective : II	25MAU22A/ 25MAU22B	Operations Research – II / Mathematical Modelling –II	Mrs.P.Vidhya Mrs.P.Yamunarani
Part III	Core : XXIV Elective : III	25MAU23A/ 25MAU23B	Graph Theory / Fuzzy Mathematics	Mrs.S.A.Dhanalakshmi, Mrs.P.YamunaRani
Part IV	Skill Enhancement: III	25SEMAU03	Latex - Practical	Ms.L.Priya

Curriculum Structure and Syllabus for the **B.SC MATHEMATICS** programme are prepared and verified in line with the guidelines of CDC.

Prepared by   **Approved by**

Ms. L.Priya,   **Chair Person**
Assistant Professor,   **Mrs. R.Jayalakshmi,**
Department of Mathematics,   **Assistant Professor & Head,**
P.K.R. Arts College for Women,   **Department of Mathematics,**
127, Pariyur Road,   **P.K.R. Arts College for Women,**
Gobichettipalayam.   **127, Pariyur Road,**
                                                        Gobichettipalayam.

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II. CO-SCHOLASTIC COURSES:

a) VALUE ADDED COURSES:

Semester	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam		
					Theory	Practical	Total
Course to be taught after regular hours							
Value Added Course I							
Semester I	25VAU1	FUNDAMENTAL MATHEMATICS AND COMMUNICATION SKILLS	2 (SEM I)	3	25	25	100
Semester II			2 (SEM II)				
Value Added Course II							
Semester III	25VAU2	NUMBER ANALOGIES AND COMPREHENSIVE EVALUATION	2 (SEM III)	3	25	25	100
Semester IV			2 (SEM IV)				
Value Added Course III							
Semester V	25VAU3	SPATIAL ABILITY	2 (SEM V)	3	25	25	100
Semester VI			2 (SEM VI)				
						TOTAL	300

b) CERTIFICATE COURSE

Semester	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam		
					Theory	Practical	Total
Course to be taught after regular hours							
Certificate Course							
Semester III	25MACCU1	C Programming					
Semester IV							

c) COURSES WITH CREDIT TRANSFERABILITY

d) ADD-ON COURSES

Category	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam
					Total
ADD-ON COURSE - I		Functional English (Offered by the Department of English)	2	3	100
ADD-ON COURSE - II		Yoga and meditation (Offered by the Department of Tamil)	2	3	100

e) EXTRA CREDIT COURSES (Self-study courses)

1. Courses offered by parent department for ALL STUDENTS OF THE PROGRAMME
2. Courses offered by parent department for ADVANCED LEARNERS OF THE PROGRAMME
3. Courses offered in a department under PART-III for STUDENTS OF OTHER PROGRAMMES – Inter-disciplinary courses
4. Credit transferability for Disciplinary / Inter-disciplinary / Trans-disciplinary / General courses offered in UGC SWAYAM MOOCS
5. Comprehension Courses

List of courses offered for ADVANCED LEARNERS ONLY (Self-Study)

Course Code	Department	Courses offered for ADVANCED LEARNERS ONLY
25MAALU1		1) Numerical Techniques
25MAALU2	Department of Mathematics	2) Matrix Theory
25MAALU3		3) Group Theory
25MAALU4		4) Vedic Mathematics

SYLLABUS

(For students admitted from 2025-2026 & onwards)
SEMESTER – I

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : I**	**25MAU01**	**ALGEBRA AND TRIGONOMETRY**	**60**	**4**

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	**I**	**25**	**75**	**100**

PREAMBLE:

To enable the students to understand the concepts of convergence and divergence of series, find roots of various types of equations, and gain comprehensive knowledge on the expansion of trigonometric and hyperbolic functions, along with techniques for summation of series.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the concepts of Binomial, Exponential, Logarithmic series, Convergence and Divergence of series, multiple roots of an equation, cosines and sines of multiples of θ, logarithmic of complex quantity.	K_1
CO2	express the theory of equations, Convergence and Divergence of series and illustrate the concepts of summation of series using binomial, exponential and logarithmic series theorem	K_2
CO3	apply Binomial, Exponential, Logarithmic series for finding summation of series, appropriate convergence tests to analyze series and use numerical techniques to find roots of algebraic and transcendental equations. and the roots of an equation.	K_3
CO4	analyze the Binomial, Exponential, Logarithmic, convergence and divergence of series and trigonometric and hyperbolic functions through their series expansions and interpret their behavior in mathematical problems.	K_4
CO5	evaluate the multiple roots and summation of series of the problems by using different types of methods and the summation of series using suitable techniques in solving equations. Determine relationship between circular and hyperbolic functions and the summation of trigonometric series	K_5

K_1 **- Remember;** K_2 **– Understand;** K_3 **- Apply;** K_4 **- Analyze;** K_5 **– Evaluate.**

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	9	9	3	3
CO4	9	3	3	3	3	1	1
CO5	3	3	3	3	3	1	1
Total Contribution of COs to POs	39	33	33	33	33	11	11
Weighted Percentage of COs contribution to POs	2.24	2.08	2.24	2.42	3.77	1.43	1.60

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I: BINOMIAL, EXPONENTIAL THEOREM AND LOGARITHMIC SERIES
                                                                    (12 Hours)

Binomial – Exponential – Logarithmic series (Theorems without proof) –related problems.

UNIT – II: THEORY OF EQUATIONS   **(12 Hours)**
Roots of an equation - Transformations of equations- Reciprocal equations - Descartes's rule of signs -Rolle's Theorem - Multiple roots - Horner's method.

UNIT III: CONVERGENCE AND DIVERGENCE OF SERIES   **(12 Hours)**
Convergence and divergence of series –Definitions -Comparison tests-Cauchy's condensation test - De Alembert's test-Cauchy's root test - Raabe's test.

UNIT IV: EXPANSION IN SERIES   **(12 Hours)**
Expansions of $\sin^n\theta$, $\cos^n\theta$ in powers of $\sin\theta$, $\cos\theta$ - Expansion for $\tan\theta$ in terms of $\tan\theta$, Expansions of $\cos\theta$, $\sin\theta$, and $\tan\theta$ in powers of θ – related problems.

UNIT V: EXPONENTIAL SERIES AND HYPERBOLIC FUNCTIONS   **(12 Hours)**
Exponential Series **-**Hyperbolic functions – Relations connecting circular and hyperbolic functions Inverse hyperbolic functions - related problems.

TEXT BOOK
1. Manicavachagom Pillay, T.K., Natarajan.T, Ganapathy.K.S. (2017)– "Algebra Volume - I", publishedby: Divya Subramanian for Ananda book Depot, Chennai. (**FOR UNIT I, II & III**)
2. Kandasamy. P, Thilagavathi. K - "Mathematics for B.Sc. Branch I", Volume I, (2004) S.Chand and Company Ltd, New Delhi. (**FOR UNIT IV &V**)

UNIT	CHAPTER	PAGE NUMBER
I	1	143-150, 188-205 213-225
II	1	282-291, 318-326 351-360, 376-381
III	2	41-81
IV	2	122-131
V	2	142-155

REFERENCE BOOKS:

1. W.S. Burnstine and A.W. Panton, Theory of equations

2. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.

3. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003

WEB REFERENCES:

1. http://www.jjernigan.com/172/ConvergenceDivergenceNotes.pdf
2. http://home.iitk.ac.in/~psraj/mth101/lecture_notes/Lecture11-13.pdf
3. https://maths4uem.files.wordpress.com/2015/09/1028-infinite-series.pdf

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : II	25MAU02	DIFFERENTIAL CALCULUS	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:
To enable the students to learn and gain knowledge about differentiation.
COURSE OUTCOME:
On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	remember all the formulae in differentiation	K_1
CO2	explain the differentiation of derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K_2
CO3	apply various differential formulae for solving successive differentiation, maxima and minima, partial differentiation and curvature	K_3
CO4	analyze the properties of derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K_4
CO5	evaluate the two variable and three variable functions by using derivatives, successive differentiation, maxima and minima, partial differentiation and curvature	K_5

K_1 **- Remember;** K_2 **– Understand;** K_3 **- Apply;** K_4 **- Analyze;** K_5 **– Evaluate.**

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	22	22	8
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	2.51	2.86	1.16

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I **DERIVATIVES** **(10 Hours)**

Introduction – Derivative of a constant function – Algebra of derivatives – Derivative of $y = x^n$ - Derivative of $y = e^x$ - Derivative of $y = a^x$ - Derivative of $y = \log_e x$ - Derivative of Trigonometric functions – Derivatives of inverse Trigonometric functions – Derivative of hyperbolic functions –

Derivative of inverse hyperbolic functions – Derivative of parametric function – Differentiation of implicit function – Logarithm differentiation – Differentiation of infinite series.

UNIT - II   SUCCESSIVE DIFFERENTIATION   (10 Hours)

Definition – n^{th} derivatives of some standard functions – Determination of nth derivative of rational functions – The derivatives of the products of the powers of sines and cosines – Leibnitz's theorem.

UNIT - III   MAXIMA AND MINIMA   (10 Hours)

Maxima and Minima values of a function – A necessary condition for extreme values – Sufficient condition for extreme values – Use of II order derivatives – Application to problems.

UNIT - IV   PARTIAL DIFFERENTIATION   (10 Hours)

Introduction – Functions of two variables – Functions of three or more variables – Neighbourhood of a point (a,b) – Continuity of a function of two variables – Limit of a function of two variables – Partial derivatives – Geometrical representation of a function of two variables – Homogenous function – Total differentials – Differentiation of composite function – Change of variables – Differentiation of implicit function.

UNIT - V   CURVATURE   (8 Hours)

Curvature – Radius of curvature in Cartesian and Polar coordinates – Centre of curvature – Evolutes & Involutes.

TEXT BOOK

1) Mohanty R.K (2014) – "Differential Calculus" – ANMOL Publications pvt ltd.

2) Narayanan.S. and Manicavachasam Pillai.T.K (2017) – "Calculus vol 1"- Viswanathan Publishers.

TEXT BOOK	UNIT	CHAPTER	PAGE NUMBER
Book 1	Unit - I	Chapter 4	Page: 82 - 125
Book 1	Unit – II	Chapter 5	Page: 129 - 160
Book 1	Unit –III	Chapter 8	Page: 241 – 265
Book 1	Unit -IV	Chapter 10	Page: 288-323
Book 2	Unit – V	Chapter 7	Page: 281-316

REFERENCE BOOK

Kandasamy. P & Thilagavathy (2004) - "Mathematics for B.Sc. –Vol I and. II", S.Chand and Co.

WEB REFERENCES:

https://youtu.be/KijGLjxKlsY

https://youtu.be/mzj25fNxobc

https://www.slideshare.net/lohit91/maxima-minima

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART IV	FOUNDATION : I	25FCU01	ENVIRONMENTAL STUDIES	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	50	-	50

PREAMBLE:

To bring about an awareness of a variety of environmental concerns and to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyle

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Define environment, ecosystem, biodiversity, environmental pollution and social issues.	K1
CO2	Explain the natural resources, types of ecosystem, geographical classification of India, causes of environmental pollution and the problems related to the society.	K2
CO3	Identify the information related to environment and the resources to protect it.	K3
CO4	Analyze the classification of natural resources, energy flow in the ecosystem, threats to biodiversity, disaster management and the role of information technology in environment and human health.	K4
CO5	Assess the environmental issues with a focus on sustainability.	K5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	1	3
CO3	9	9	9	9	1	1	3
CO4	9	9	9	9	1	1	3
CO5	9	9	3	3	1	1	3
Total Contribution of COs to POs	45	45	39	39	9	7	15
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.03	0.91	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I (4 Hours)

Multidisciplinary Nature of Environmental Studies:

Environment: Definition, Components, Segments and Types. **Natural Resources:** Meaning, Components: (1. **Forest**-Meaning, Importance and Types 2. **Water** - Meaning, Types and Problems 3. **Mineral**- Meaning and Classification 4.**Food**-Meaning and Problems 5.**Energy**- Meaning, Forms and Types 6.**Land**- Meaning, Structure and Functions, Components), **Classification**: Renewable and Non-Renewable Resources, Role of an Individual in Conservation of Natural Resources.

UNIT II (5 Hours)

Ecosystems – Definition, Features, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in the Ecosystem (Water, Carbon, Nitrogen, Oxygen and Energy), Food Chains, Food Webs and Ecological Pyramids

Introduction Types, Characteristics Features, Structure and Function of the following Ecosystem:

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Ocean, Estuaries)

UNIT III (5 Hours)

Biodiversity and its Conservation-Introduction – Definition – Genetic, Species and Ecosystem Diversity, Bio geographical Classification of India -Value of Biodiversity – Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Value- Biodiversity at Global, National and Local Levels- India as a Mega-Diversity Nation- Hot-Spots of Biodiversity- Threats to Biodiversity – Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts- Endangered and Endemic Species of India Conservation of Biodiversity – In-situ and Ex-situ and Conservation of Biodiversity.

UNIT IV (5 Hours)

Environmental Pollution: Definition, Causes, Effects, control measures and Prevention Acts for Air, Water, Soil, Noise, Thermal Pollutions and Nuclear Hazards. **Solid Waste Management**: Meaning, Causes, effects and control measures of urban andindustrial wastes.**Disaster Management**: Meaning, Types of Disasters: floods, earthquake, cyclone and landslides.**Environmental Ethics:** Issues and possible solutions- Climate change, global warming, acid rain, ozone layer depletion, nuclear - accidents and holocaust. Consumerism and waste products, Public Awareness.

UNIT V (5 Hours)

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

Human Population and the Environment: Population growth and distribution- Population explosion – Family Welfare Programme-Environment and human health- HIV/AIDS- Role of Information Technology in Environment and human health- Medical transcription and bio-informatics.

REFERENCE

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad

3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,

6. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p

7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

8. Down to Earth, Centre for Science and Environment (R)

9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,

10. Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p

11. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural

12. History Society, Bombay (R)

13. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment,Cambridge   Univ. Press 1140p.

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

15. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.

16. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)

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

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

19. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.

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

21. Survey of the Environment, The Hindu (M)

22. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, BlackwellScience (TB)

SEMESTER - II

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : IV**	**25MAU04**	**ANALYTICAL GEOMETRY**	**60**	**4**

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	**II**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn and visualize the fundamental ideas about conic, straight line, Sphere, cone, cylinder and conicoid.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions based on conic, Straight line, Sphere, cone, cylinder and conicoid.	K_1
CO2	express the concepts of conic, Straight line, Sphere, cone, cylinder and conicoid.	K_2
CO3	Apply the various concepts of straight lines, conic, sphere, cone, cylinder and conicoid to determine the respective equations.	K_3
CO4	Analyze the concepts of two dimensional and three dimensional Analytical Geometry.	K_4
CO5	Evaluate the equation of a conic, sphere, cone, cylinder and shortest distance between two straight lines.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate.**

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	3	3	3	3	3	3
CO5	3	3	3	3	1	1	1
Total Contribution of COs to POs	39	33	33	33	13	13	13
Weighted Percentage of COs contribution to POs	2.24	2.08	2.24	2.42	1.48	1.69	1.89

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I   **CONIC**   **(12 Hours)**

Polar coordinates equation of a conic - Directrix-Chord- Tangent-Normal- Simple problems.

UNIT - II   **STRAIGHT LINES**   **(12 Hours)**

Straight lines - Coplanarity of straight-line-Shortest Distance (S.D) and equation of S.D between two lines-Simple problems.

UNIT - III SPHERE   **(12 Hours)**

Sphere-Standard equation of sphere-Results based on the properties of a sphere-Tangent plane to a sphere- Equation of a circle.

UNIT - IV   **CONE AND CYLINDER**   **(12 Hours)**

Cone whose vertex is at the origin- Envelope cone of a sphere - Right circular cone-Equation of a cylinder- Right circular cylinder.

UNIT - V   **CONICOIDS**   **(12 Hours)**

Nature of a conicoid- Standard equation of central conicoid –Enveloping cone tangent
Plane- Condition for tangency – Director Sphere.

TEXT BOOKS

1. Manickavasagam Pillai.T. K. and Natarajan.T, (2016) - "Analytical Geometry of 2D",
   S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai.

2. Manickavasagam Pillai.T. K. and Natarajan.T, (2016) - "Analytical Geometry of 3D",
   S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai.

UNIT	BOOK	CHAPTER	PAGE NUMBER
Unit - I	Book - 1	Chapter 9	Page: 325-330 Results without proof and Page 331-363
Unit – II	Book –2	Chapter 3	Page: 46- 71
Unit – III	Book - 2	Chapter 4	Page: 92 – 110
Unit – IV	Book - 2	Chapter 5	Page: 115 – 138
Unit - V	Book - 2	Chapter 5	Page: 141 – 160

REFERENCE BOOK

Bali.N.P. (1991) – "Solid Geometry", Laxmi Publications (P) Ltd.

WEB RESOURCES:

1. http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/

2. http://egyankosh.ac.in/bitstream/123456789/11990/1/Unit-2.pdf

3. https://en.wikipedia.org/wiki/Analytic_geometry

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits

PART III	CORE : V	25MAU05	INTEGRAL CALCULUS	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about integration.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of Integration	K_1
CO2	explain the integration of rational, irrational, trigonometric and Improper integrals	K_2
CO3	apply various integral formulae to solve rational, irrational, trigonometric and Improper integrals	K_3
CO4	analyze the properties of Methods of integration, integration of rational-irrational- trigonometric functions, Beta and Gama functions and convergence/divergence of integrals	K_4
CO5	evaluate double and triple integrals by using Methods of integration, Integration of rational- irrational- trigonometric functions and Improper integrals.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate.**

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	3
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	22	22	8
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	2.51	2.86	1.16

**Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs**

COURSE CONTENT:

UNIT - I **METHODS OF INTEGRATION** **(10 Hours)**

Methods of integration – Integration by substitution – Three important deduction of substitution – Six important integrals – Integration of some important forms – Integration by parts of a product – Extension of the rule of integration by parts.

UNIT - II **INTEGRATION OF RATIONAL FUNCTION** **(10 Hours)**

Introduction – Linear non-repeated factors only in the denominator – Linear repeated factors only in the denominator – Quadratic non-repeated factors only in the denominator – Quadratic repeated factors only in the denominator – Integration without breaking into partial fraction – Integrand consisting of even power of x only – Integration of algebric rational functions by substdxitution2 - Integration of algebric rational functions of e^x.

UNIT - III **INTEGRATION OF IRRATIONAL FUNCTIONS** **(10 Hours)**

Integration of rational function of $(ax+b)^{1/n}$ - Integrals of the type (i) $\int \sqrt{(ax^2+bx+c)}\,dx$ (ii) $\int (px+q)\sqrt{(ax^2+bx+c)}\,dx$ - Integrals of the type (i) $\int \frac{dx}{\sqrt{(ax^2+bx+c)}}$ (ii) $\int \frac{px+q}{\sqrt{(ax^2+bx+c)}}\,dx$ - Integration of $\int \frac{dx}{(px+q)\sqrt{(ax+b)}}$, $\int \frac{dx}{(px^2+qx+r)\sqrt{(ax+b)}}$, $\int \frac{dx}{(px+q)\sqrt{(ax^2+bx+c)}}$, $\int \frac{dx}{(px^2+qx+r)\sqrt{(ax^2+bx+c)}}$, $\int x^p (a+bx^n)^q \, dx$.

UNIT - IV **INTEGRATION OF TRIGONOMETRIC FUNCTIONS** **(10 Hours)**

Integration of - $\sin^n x$, n>0 – $\cos^n x$, n>0 – $\tan^n x$ and $\cot^n x$, n>0 – $\sec^n x$, $\csc^n x$, x>0 - $\sin^p x \cos^q x$, p>0, q>0 – Integration $\sin^p x \cos^q x$, when p+q is a negative even integer.

UNIT - V **IMPROPER INTEGRALS** **(8 Hours)**

Beta and Gamma integrals-their properties, relation between them-Evaluation of multiple integrals using Beta and Gamma functions.

***Introduction to Industry 4.0** – Needs – Reasons for Adopting Industry 4.0 – Definition – Goals and Design Principles – Technologies of Industry 4.0 - Skills required for Industry 4.0.*

TEXT BOOK

i) Mohanty R.K (2014) – "Integral Calculus" – ANMOL Publications Pvt ltd.

ii) Narayanan.S. and Manicavachasam Pillai.T.K (2017) – "Calculus vol 2"- Viswanathan Publishers.

iii) P. Kaliraj, T. Devi – "Higher Education for Industry 4.0 and Transformation to Education 5.0".

BOOK	UNIT	CHAPTER	PAGE NUMBER
Book I	Unit - I	Chapter 1	Page: 1 - 57
Book I	Unit – II	Chapter 2	Page: 59 - 81
Book I	Unit –III	Chapter 3	Page: 86 – 122
Book I	Unit -IV	Chapter 4	Page: 124-165
Book II	Unit – V	Chapter 7	Page: 278-300

REFERENCE BOOK

Kandasamy. P & Thilagavathy (2004) - "Mathematics for B.Sc. –Vol I and. II", S.Chand and Co.

WEB REFERENCES:

1. https://www.slideshare.net/FarzadJavidanrad/integral-calculus-43522803V

2. https://www.youtube.com/watch?v=o75AqTInKDU

3. https://www.youtube.com/watch?v=bzIrspIDYIs

4. https://hapticmedia.com/blog/industry-4.0/

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits

PART IV	FOUNDATION COURSE II	25FCU02	HEALTH AND WELNESS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	50	--	50

PREAMBLE:

To promote holistic well-being by enhancing knowledge, skills, and habits related to physical, mental, emotional, and social health.

COURSE OUTCOME

On the successful completion of the course, students will be able to:

COs	CO Statement	Knowledge Level
CO1	Recollect the fundamental concepts of physical, mental, social, intellectual well-being, and substance-free living	K1
CO2	Demonstrate understanding of the importance of yoga, value education, healthy living practices, and social bonding	K2
CO3	Apply techniques of yoga, healthy habits, substance-free practices, and value-based actions in daily life	K3
CO4	Classify the components of physical health, social well-being practices, mental exercises, and ethical values	K4
CO5	Evaluate the role of health, wellness practices, yoga, and values in achieving holistic personal development	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	3	1	1	3
CO2	9	9	9	3	3	1	3
CO3	9	9	9	3	3	3	3
CO4	9	9	9	3	3	3	3
CO5	9	9	9	3	3	3	3
Total Contribution of COs to POs	45	45	45	15	13	11	15
Weighted Percentage of COs Contribution to POs	2.58	2.83	3.05	1.10	1.48	1.43	2.18

Level of correlation: 0 – No correlation; 1- Low correlation; 3 – Medium correlation; 9 – High correlation between COs and POs As per UGC Notification

COURSE CONTENT

Unit I: Physical Well-being   **(5 Hours)**

Definition and distinction between health and wellness, Components of physical well-being. Role of physical activity in health: Local, demographic, and societal factors affecting health and wellness. Balanced diet essentials: Carbohydrates, Proteins, Fats, Vitamins, Minerals, Nutritional disorders – malnutrition, under nutrition, over nutrition

Unit II: Substance-Free Well-Being   **(5 Hours)**

Introduction to Substance-Free Well-Being, Impact of Substance Misuse, Commonly Misused Substances, Consequences of Substance Misuse- Recognizing Signs of Addiction, Peer Pressure and Substance Use. Healthy Alternatives to Coping with Stress- The Role of Self-Care in Substance-Free Well-Being, Seeking Support for Substance Misuse- Benefits of a Substance-Free Lifestyle

Unit III: Social Well Being   **(5 Hours)**

Practicing Gratitude-Building relation with Family, Friends, relatives, mentors and colleagues- Cultivating Kindness and Compassion-, Practicing Forgiveness, Celebrating Differences, Digital Detox: Meaning and Concept, Need for Digital Detox, Digital addiction symptoms, Benefits of Digital Detox, Strategies for a Successful Digital Detox

Unit IV: Mental Well Being   **(5 Hours)**

Meaning and definition of yoga- Aims and objectives of yoga- Basic principles of yoga Importance of yoga in daily life, Yoga for mental attitude, Integration of mind, body, breath, and emotions.

Practice:

Dynamic Exercise- Surya Namaskar-Basic Set of Asanas-Pranayama & Kriya.

Unit V: Intellectual Well Being   **(4 Hours)**

Meaning, need, and significance of ethical values- Types of values. Value education: aim and importance, Components of value education: self-discipline, self-confidence, self-initiative, empathy, compassion, forgiveness, honesty, sacrifice, sincerity, self-control, tolerance, courage.

Reference Books:

1. Edlin, G., & Golanty, E. (2020). Health and Wellness (13th ed.). Jones & Bartlett Learning.
2. Thompson, J., & Manore, M. (2017). The Science of Nutrition (4th ed.). Pearson Education.
3. Fisher, G. L., & Harrison, T. C. (2013). Substance Abuse: Information for School Counsellors, Social Workers, Therapists, and Counsellors (5th ed.). Pearson Education.
4. Vethathiri Maharishi (2015), 'Yoga for human excellence'- Sri Vethathiri Publications
5. Value Education for human excellence- study material by Bharathiar University.
6. Value Education - Study Material by P.K.R Arts College for Women.

Web References:

1. https://www.who.int/health-topics/nutrition
2. https://nida.nih.gov/drug-topics
3. https://greatergood.berkeley.edu/
4. https://www.yogaalliance.org/About_Yoga/What_is_Yoga
5. https://livingvalues.net/

SEMESTER - III

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : VIII	25MAU08	**DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS**	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	25	75	100

PREAMBLE:

To enable the students to learn the method of solving Ordinary Differential Equations and Partial Differential Equations.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of ordinary, partial and linear differential equations.	K_1
CO2	identify the solutions of ordinary, partial differential equations and equations of first order differential equations.	K_2
CO3	apply Clairaut's form, general integral, Lagrange linear equations and Charpit's method to solve the differential equations.	K_3
CO4	analyze the difference between partial differential equations and Ordinary differential equations.	K_4
CO5	evaluate the solutions for ordinary, partial, linear differential equations.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	27	15	15
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	3.08	1.95	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and Pos

COURSE CONTENT:

UNIT – I: ORDINARY DIFFERENTIAL EQUATIONS: (12 Hours)

Variable separable - Homogeneous Equation – Non - Homogeneous Equations of first degree in x and y - Linear Equation - Bernoulli's Equation.

UNIT – II: EQUATIONS OF FIRST ORDER BUT NOT OF HIGHER DEGREE:
                                                        (12 Hours)
Equation solvable for dy/dx- Equation solvable for y- Equation solvable for x - Clairauts form - Linear Equations with constant coefficients - Particular integrals e^{ax}, sinax, cosax, x^m, Ve^{ax} where V is sinax or cosax or x^m .

UNIT – III: SIMULTANEOUS LINEAR DIFFERENTIAL EQUATIONS   (12 Hours)

Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a known integrals- Reduction to the Normal form- Change of the Independent Variable - Method of Variation of Parameters.

UNIT – IV: PARTIAL DIFFERENTIAL EQUATION: (12 Hours)

Formation of PDE by Eliminating arbitrary constants and arbitrary functions-complete integral-singular integral-General integral- Lagrange's Linear Equations Pp+Qq=R.

UNIT – V: PARTIAL DIFFERENTIAL EQUATION: (12 Hours)

Special methods - Standard forms - Charpit's Methods - Related problems.

TEXT BOOK:

S.Narayanan, T.K.Manikavachagam Pillay - "Differential Equations and its Applications", S.Viswanathan (Printers and Publishers) Pvt. Ltd(2014).

UNIT	CHAPTER	PAGE NUMBER
Unit - I	Chapter 2	7-20
Unit – II	Chapter 4,5	60-64 68-88
Unit - III	Chapter 6,8	125-130; 145-155
Unit - IV	Chapter 12	219- 228
Unit - V	Chapter 12	232-238; 240-247

REFERENCE BOOKS:

1. Mathematics for B.Sc-Branch-I Volume –III by P.Kandasamy, K.Thilagavathy

    S.Chand Publications.

2 .Differential Equations by N.P.Bali, Laxmi Publications Ltd, New Delhi-2004.

3. Ordinary and Partial differential Equation by Dr.M.D.Raisinghania, S.Chand.

WEB RESOURCES:

1. http://www.nptelvideos.in/2012/11/mathematics-iii.html
2. https://www.digimat.in/nptel/courses/video/111108081/L02.html
3. https://www.ijsr.net/archive/v2i1/ijsron2013331.pdf
4. https://www.whitman.edu/mathematics/calculus_online/chapter17.html

Category	Course Type	Course Code	Course Title	Contact Hours	Credits
PART III	CORE : IX	25MAU09	**INTEGRAL AND VECTOR ANALYSIS**	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	25	75	100

Preamble

To enable the students to learn and gain knowledge about integrals and vector field.

Course Outcomes

On the successful completion of the course, students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall fundamental concepts and basic formulas related to integration, multiple integrals, change of variables using Jacobians, vector differentiation, and vector integration including key theorems.	K_1
CO2	Gain the knowledge about integration to compute arc lengths, volumes of revolution and surface areas of revolution and the basic principles of vector differentiation and integration including the verification of classical theorems.	K_2
CO3	Apply techniques of single, multiple, and vector integration, and perform change of variables using Jacobians to solve problems involving scalar and vector fields in applied contexts.	K_3
CO4	Analyze scalar and vector fields, evaluate multiple integrals including transformations, and verify classical vector theorems such as Green's, Gauss's, and Stokes' using appropriate techniques of integration and vector differentiation.	K_4
CO5	Evaluate complex integrals and vector calculus problems by applying advanced techniques such as multiple integrals, coordinate transformations, and vector differentiation/integration theorems, and justify their applications in mathematical and physical contexts.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

58

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	3	3
CO2	9	9	9	9	9	3	3
CO3	9	9	9	3	3	3	3
CO4	9	3	3	3	3	0	0
CO5	3	3	3	1	1	0	0
Total Contribution of COs to POs	39	33	33	25	25	9	9
Weighted Percentage of COs contribution to POs	2.24	2.08	2.24	1.84	2.85	1.17	1.31

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

UNIT I: INTEGRATION   (12 Hours)

Integration-definite integral-method of integration-integration of rational algebraic functions-integration of irrational function.

UNIT II: MULTIPLE INTEGRAL   (12 Hours)

Evaluation of double integral – double integrals in polar coordinates-Evaluation of triple integrals-Applications multiple integrals.

UNIT III: CHANGE OF VARIABLE   (12 Hours)

Jacobion-change of variable in double and triple integrals- transformations from Cartesian to polar coordinates- transformations from Cartesian to spherical polar coordinates.

UNIT IV: DIFFERENTIATION OF VECTORS   (12 Hours)

Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl.

UNIT V: INTEGRATION OF VECTORS   (12 Hours)

Integration of vectors – Line integral – Surface integral – Green's theorem in the plane – Gauss divergence theorem – Strokes theorem – (Statements only) - Verification of the above said theorems.

TEXT BOOK

1. Narayanan.S. and Manicavachasam Pillai.T.K (2017) – "Calculus volume 2"-Viswanathan Publishers.

2. Kandasamy. P, Thilagavathi. K - "Mathematics for B.Sc. Branch I", Volume IV (2005), S.Chand and Company Ltd, New Delhi.

UNIT	BOOK	CHAPTER	PAGE NUMBER
Unit – I	Book – I Vol – II	Chapter I	Page: 1 - 60
Unit –II	Book – I Vol – II	Chapter V	Page: 203 – 228
Unit -III	Book – I Vol – II	Chapter VI	Page: 251 - 269
Unit -IV	Book – II Vol – IV	Chapter I Chapter II	Page: 1 - 7 Page: 8 - 23
Unit -V	Book – II Vol – IV	Chapter III	Page: 24 – 92

REFERENCE BOOKS:

1. Kandasamy. P & Thilagavathy (2004) - "Mathematics for B.Sc. –Vol I and. II", S.Chand and Co.

2. Narayan.S and Manicavachagam Pillay.T.K. (1993) - "Ancillary Mathematics", Viswanathan Publishers and Printers Pvt. Ltd.

WEB RESOURCES:

1. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Vector_Calculus_(Corral)/04%3A_Line_and_Surface_Integrals/4.06%3A_Gradient_Divergence_Curl_and_Laplacian

2. https://youtu.be/8j4iVnzseMg?si=40_-4ld1zrhaZEe1

3. https://youtu.be/jOYwuvrRK08?si=mmBJcHkhOafOEocy

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : X ALLIED : III	25MAU10	TRANSFORMATION TECHNIQUES	48	4

Contact Hours per Week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
II	II	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about Laplace Transforms and its inverse, Fourier series and Fourier Transform.

COURSE OUTCOME:

On the successful completion of the course, the students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of Laplace Transforms, The inverse Laplace Transforms, Fourier series, Z-Transform and Fourier Transform .	K_1
CO2	Explain the concepts of Laplace Transforms, The inverse Laplace Transforms Fourier series, Z-Transform and Fourier Transform .	K_2
CO3	Apply the concepts of Laplace Transforms and Fourier series	K_3
CO4	Compare the concepts of Fourier series and Fourier Transform	K_4
CO5	Evaluate the Z-Transform and its properties, Laplace Transforms and Fourier Transform	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to POs	45	45	39	39	15	15	15
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.71	1.95	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT- I :   LAPLACE TRANSFORMS   (10 Hours)

      The Laplace Transforms-Definitions-Sufficient conditions for the existence of the Laplace Transform (without proof)-Laplace transform of periodic functions-some general theorems-evaluation of integrals using Laplace transform-Problems.

UNIT – II :   INVERSE LAPLACE TRANSFORMS   (10 Hours)

      The inverse Laplace Transforms- Applications of Laplace Transforms to ordinary differential equations with constant co-efficients and variable co-efficients, simultaneous equations and equations involving integrals-Problems.

UNIT -III :   FOURIER SERIES   (10 Hours)

      Fourier series- Expansion of periodic functions of period 2π- Expansion of even and odd functions, Half range Fourier series-Change of intervals –Problems.

UNIT- IV :   FOURIER TRANSFORM   (10 Hours)

      Fourier Transform- Infinite Fourier Transform(Complex form) – Properties of Fourier Transform – Fourier cosine and Fourier sine Tranform – Properties – Parseval's identity – Convolution theorem - Problems.

UNIT- V :   Z TRANSFORMS   (8 Hours)

      Z Transforms: Definition of Z-Transform and its properties - Z-Transforms of some basic functions- Examples and simple problems

TEXT BOOKS :

1. "Calculus-Volume III" – S.Narayanan and T.K.ManicavachagamPillai. (Ananda Book Depot)
    (for Units I to IV).
2. "Engineering Mathematics for Semester III- Third Edition – Kandasamy. P, Thilagavathi. K,and
    Gunavathy.K . S.Chand and Company Ltd, New Delhi. (for Unit-V)

UNIT	BOOK	CHAPTER	PAGE NO
I	**I**	**V**	**154-173**
II	**I**	**V**	**174-201**
III	**I**	**VI**	**202-234**
IV	**I**	**VI**	**247-270**
V	**II**	**V**	**371-390**

REFERENCE BOOKS :

1. "LAPLACE AND FOURIER TRANSFORMS" – Dr.J.K.Goyal and K.P.Gupta.
    (Pragati Prakashan Depot) .
2. "Mathematics for B.Sc. Branch I", Volume IV (2015), Kandasamy. P, Thilagavathi. K .
    S.Chand and Company Ltd, New Delhi.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Laplace_transform
2. https://en.wikipedia.org/wiki/Fourier_series
3. https://en.wikipedia.org/wiki/Fourier_transform
4. https://www.youtube.com/watch?v=XJRW6jamUHk

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART IV	ABILITY ENHANCEMENT : I	25AEU01	INFORMATION SECURITY	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	50	-	50

PREAMBLE :
To learn about the basics of Information Security.

COURSE OUTCOME:
On the successful completion of the course, students will be able to

COs	CO Statement	Knowledge Level
CO1	Recall the fundamental concepts of Information Security, Risk and Security policies	K1
CO2	Discuss the concepts of Risks, vulnerabilities, ethical and privacy issues	K2
CO3	Apply the ideas in security planning and construct the policies	K3
CO4	Categorize the Privacy, Ethical Issues, Laws, Software Issues and Crimes	K4
CO5	Summarize Cryptography, cipher text and threats in information security	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate
CO-PO MAPPING (COURSE ARTICULATION MATRIX)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	1	1
Total Contribution of COs to POs	45	45	45	45	27	25	19
Weighted Percentage of COs Contribution to POs	2.58	2.83	3.05	3.31	3.08	3.25	2.76

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation; 9- High correlation between COs and POs.

INFORMATION SECURITY

Unit-I: **INTRODUCTION TO INFORMATION SECURITY**   **(5 HOURS)**

Introduction - Growing IT Security Importance and New Career - opportunities - Becoming an Information Security Specialist - Contextualizing Information Security.

Unit-II: **CYBER LAWS**   **(5 HOURS)**

Law, Investigations and Ethics: Introduction - Types of Computer Crime - How Cyber Criminals Commit Crimes -The Computer and the Law - Intellectual Property Law - Privacy and the Law - Computer Forensics.

Unit-III: PHYSICAL SECURITY CONTROL   **(5 HOURS)**

Introduction - Understanding the Physical Security Domain - Physical Security Threats - Providing Physical Security.

Unit-IV: ACCESS CONTROL SYSTEMS AND METHODOLOGY   **(5 HOURS)**

Introduction - Terms and Concepts - Principles and Authentication - Biometrics-Single Sign - On-Remote User Access and Authentication.

Unit-V: **SECURING THE FUTURE**   **(4 HOURS)**

Introduction-Continuous Monitoring and Constant Vigilance - Operation Eligible Receiver - Identity Theft and the U.S. Regulatory Environment-Growing Threats - Trends in Security Threats-The Rosy Future for InfoSec Specialists.

Reference Book:

"Information Security - Principles and Practices" Mark Merkow & Jim Breithaupt, Pearson Prentice Hall, 2007.

Chapters and Page Numbers:

Unit I : Chapter I - 29-37,

Unit II : Chapter 7 – 169-180,

Unit III : Chapter 8 – 193-206,

Unit IV : Chapter 10 – 233-248,

Unit V : Chapter 14 – 345-352

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART IV	NON – MAJOR ELECTIVE	25NMU01A/ 25NMU01B	INDIAN WOMEN AND SOCIETY/ ADVANCED TAMIL	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	III	50	--	50

PREAMBLE:

To familiarize students with the specific cultural contexts of women in India

COURSE OUTCOME:

After completion of the course, the learners will be able to:

COs	CO Statement	Knowledge Level
CO1	know women status in Indian society as an academic discipline	K1
CO2	interpret the various roles of women, challenges and issues faced by them in the society	K2
CO3	find out solutions to their legal issues and product themselves from the violence against women emphasize on women entrepreneurship for their empowerment	K3
CO4	critically analyze the lifestyle and challenges of women	K4
CO5	discuss the importance of women health and issues related to women in general	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	0	0	0
CO2	9	9	9	9	3	0	3
CO3	9	9	9	9	9	9	9
CO4	3	3	3	9	9	9	9
CO5	3	3	1	1	1	9	9
Total Contribution of COs to POs	33	33	31	37	22	27	30
Weighted Percentage of COs Contribution to POs	1.90	2.08	2.10	2.72	2.51	3.51	4.35

Level of correlation: 0 – No correlation; 1- Low correlation; 3 – Medium correlation;
9 – High correlation between COs and POs

COURSE CONTENT

UNIT- I   Historical Background   (5 Hours)
History of Women's status from Vedic times, Women's participation in India's Pre and Post Independence movement and Economic Independence, fundamental rights and importance of women in Modern Society.

UNIT -II   Role of Women (Challenges & Remedies)   (5 Hours)
Women in Family, Agriculture, Education, Business, Media, Defense, Research and Development, Sports, Civil Services, Banking Services, Social Work, Politics and Law.

UNIT -III   Women and Health   (5 Hours)
Women and health issues, Malnutrition, Factors leading to anemia, Reproductive maternal health and Infant mortality, Stress.

UNIT- IV   Issues of Women   (5 Hours)
Women's issues, Dowry Related Harassment and Dowry Deaths, Gender based violence against women, Sexual harassment, Loopholes in Practice to control women issues.

UNIT- V   Women Empowerment   (4 Hours)
Meaning, objectives, Problems and Issues of Women Empowerment, Factors leading to Women Empowerment, Role and Organization of National Commission for Women, Central and State Social Welfare Board for Women Empowerment, Reality of women empowerment in the era of globalization.

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1	Mala Khullar	Writing the Women's Movement: A Reader	Zubaan	2005
2	IAWS	The State and the Women's Movement in India	IAWS, Delhi	1994
3	Kosambi, Meera	Crossing Thresholds: Feminist Essays in Social History	Permanent Black	2007
4	TRowbotham, Sheila	Hidden from History: Women's Oppression and the Fightagainst It	Pluto Press, London	1975
5	Susheela Mehta	Revolution and the Status of Women	Metropolitan Bookco.pvt ltd, New Delhi	1989

SEMESTER - IV

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XI	25MAU11	MECHANICS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE:

To enable the students to gain the knowledge about parallel forces, resultant forces, coplanar forces, projectiles, impact on a fixed surface, central orbits.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the concepts of fundamental laws, moments, coplanar forces, projectiles and equations of motion of central orbits.	K_1
CO2	explain the different types of laws, forces, radial and transverse components of orbits, height, time and range of a projectile, direct and oblique impact.	K_2
CO3	apply the principles of static equilibrium, projectiles, conservation of momentum, reduction of forces to solve simple real life problems.	K_3
CO4	analyze the equilibrium of a particle, projectiles, radial and transverse components of orbits and impact of elastic bodies.	K_4
CO5	evaluate two fold problems in central orbits, magnitude and resultant of the forces, before and after impact velocities, range on an inclined plane.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluat.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	1	1	1
Total Contribution of COs to POs	45	45	45	45	13	13	13
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	1.48	1.69	1.89

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: FORCES ACTING AT A POINT AND MOMENTS   (12 Hours)

Parallelogram law-triangle law –Converse of Triangle Law-Polygon Law of Forces- Lami's Theorem - Parallel Forces – Moments- Varignon's Theorem of moments - Generalized theorem of moments

UNIT – II: COPLANAR FORCES   (12 Hours)

Coplanar forces acting on a rigid body- Theorem on three co-planar forces- Reduction of coplanar forces- Equation to the line of action of the resultant.

UNIT – III: PROJECTILES   (12 Hours)

Path of a projectile - Greatest height -Time of flight-Range on an inclined plane through the point of projection-Maximum range.

UNIT – IV: CENTRAL ORBITS   (12 Hours)

Radial and transverse components of velocity and acceleration - Differential equation of central orbit - Pedal equations- Two-fold problems in central orbits

UNIT – V: IMPACT ON A FIXED SURFACE   (12 Hours)

Fundamental laws of impact: Newton's Experimental Law-Principle of conservation of Momentum -Impact on a smooth fixed plane

IMPACT OF SMOOTH ELASTIC SPHERES

Direct impact of two smooth spheres – Oblique impact of two smooth spheres - Loss of kinetic energy due to impact of two smooth spheres.

TEXT BOOK

1. Venkataraman M.K., (2005) – "Statics", Eleventh edition, Agasthiar Publications, Trichy.
2. Venkataraman.M.K., (2014) –"Dynamics", 16th edition, Agasthiar Publications, Trichy.

Unit	Chapter	Page
I	2 , 3	06-26, 52-75
II	5	98 & 99
	6	143-167
III	6	139-160, 172-182
IV	11	356-359, 371-383
V	8	215-228, 232-241, 244-248

REFERENCE BOOKS

1. Dharmapadam A.V. (2011) –"Statics" , S.Viswanathan Printers and Publishing Pvt., Ltd.
2. Duraipandian. P. and Laxmi Duraipandian(1988) –" Mechanics" , S.Chand and Company Ltd, Ram Nagar, New Delhi -55.
3. Prof.Khanna.M.L.(1995) –" Statics" , Fifteenth edition,Jai Prakash Nath & Co., Meerut.
4. Dharamapadam.A.V.(2011) – "Dynamics", S.Viswanathan Printers and Publishers Pvt., Ltd, Chennai.
5. Naryanamurthi.M. &Nagaratnam.N (2008)-"Dynamics", National Publishers, New Delhi.

WEB RESOURCES:

1. https://www.askiitians.com/iit-jee-physics/mechanics/motion-of-projectile.aspx
2. https://youtu.be/Shm1diiyrPY
3. https://en.wikipedia.org/wiki/Dynamics_(mechanics)

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XII	25MAU12	NUMERICAL METHODS	48	4

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about linear algebraic and transcendental equations, system of linear equations, Finite differences, Interpolation and Numerical Differentiation.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of linear algebraic and transcendental equations, simultaneous equations, numerical integration, Numerical Solution of Ordinary differential equations	K_1
CO2	explain the procedure in finding the roots and values of an equation and numerical integration, Euler methods and predictor –corrector methods	K_2
CO3	apply various methods to solve the Algebraic, Transcendental, Simultaneous equations, Numerical Differentiation and Integration.	K_3
CO4	compare the various methods involved in numerical solution of ODE	K_4
CO5	evaluate the problems by using Bisection method, iterative method, Newton-Raphson method, direct and indirect method, Newton's formula and numerical solution of ODE	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate.**

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	3	3	3	3
CO5	9	3	3	3	3	3	3
Total Contribution of COs to POs	45	39	39	33	33	33	33
Weighted Percentage of COs contribution to POs	2.58	2.45	2.64	2.42	3.77	4.29	4.79

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I : (10 Hours)
THE SOLUTION OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction – The Bisection Method – Method of Successive Approximations or the Iteration Method –Newton's Iteration Method or Newton-Raphson Method - Order of Convergence of Newton-Raphson Method.

UNIT - II :   SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS   (10 Hours)

Introduction – Gauss Elimination Method – Gauss Jordan Method - Iterative Methods – Gauss Jacobi Method of Iteration – Gauss-Seidal Method of Iteration.

UNIT – III :   NUMERICAL DIFFERENTIATION   (10 Hours)

Introduction – Newton's Forward difference Formula –Newton's Backward difference Formula -Derivative using Stirling's Formula.

NUMERICAL INTEGRATION

Numerical Integration – Trapezoidal rule – Simpson's rule.

UNIT – IV : (10 Hours)
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Introduction – n^{th} order ODE – Power series approximations-Point wise method-Taylor Series.

UNIT – V : (8 Hours)
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Euler's Method-Improved Euler's method – Runge – Kutta methods –Milne's predicator corrector formulae – Adam's predicator corrector equations.

TEXT BOOK:

Dr. Venkataraman.M.K.(2013) – "Numerical Methods in Science and Technology", The National Publishing Company, Chennai.

UNIT	CHAPTER	PAGE NUMBER
I	3	81– 90 97-105
II	4	113 – 120, 140 – 146
III	9	280 - 302
IV	11	330 – 362
V	11	369- 390

REFERENCE BOOK:

Kandasamy. P, Thilagavathi. K and Gunavathi. K (2010) - "Numerical methods" – S. Chand and Company Ltd, New Delhi.

WEB REFERENCES:

1. https://brilliant.org/wiki/newton-raphson-method/
2. https://www.geeksforgeeks.org/newton-forward-backward-interpolation/
3. https://youtu.be/v7kapVuoWhY

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
Part III	CORE : XIII ALLIED : IV	25MAU13	MATHEMATICAL STATISTICS	48	4

Contact Hours per Week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about Probability, Mathematical Expectations, various Probability Distributions and Density Functions.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of Sample Spaces, Random Variables, Moments, Moment – Generating functions.	K_1
CO2	Explain the concepts of Sample Spaces, Events, Random Variables, Moments, Moment – Generating functions.	K_2
CO3	Apply the concepts of Sample Spaces, Random Variables, moments for solving problems based on it.	K_3
CO4	Compare the concepts of Sample Spaces, Sample Points, Discrete Random Variables and Continuous Random Variables.	K_4
CO5	Evaluate the Mean, Variance, Moment - Generating Functions for different kinds of distributions like Uniform Distribution, Bernoulli Distribution, Binomial Distribution, Negative Binomial Distribution, Geometric Distribution, gamma Distribution, Exponential Distribution and Chi – Square Distribution.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	3	3	3	3	3
Total Contribution of COs to POs	45	45	39	39	15	15	15
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.71	1.95	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT- I: THEORY OF PROBABILITY   (8 Hours)
Introduction – Sample spaces – Events –The probability of an Event – Rules of Probability – Conditional Probability –Independent Events.

UNIT – II: PROBABILITY DISTRIBUTIONS   (10 Hours)
Random variables –Probability Distributions – Distribution function – Continuous Random Variables – Probability density functions – Multivariate Distributions.

UNIT –III: MATHEMATICAL EXPECTATION   (10 Hours)
Introduction – The expected value of a Random Variable – Moments - Chebyshev's theorem –Moment-Generating Functions – Product Moments.

UNIT- IV: SPECIAL PROBABILITY DISTRIBUTIONS   (10 Hours)
Introduction – The Discrete Uniform Distribution – The Bernoulli Distribution – The Binomial Distribution –The Negative Binomial and Geometric Distributions – The Hyper geometric Distribution – The Poison Distribution.

UNIT- V: SPECIAL PROBABILITY DENSITIES   (10 Hours)
Introduction – The Uniform Distribution –The Gamma, Exponential and Chi-Square Distributions – The Beta Distribution – The Normal Distribution.

TEXT BOOK :
Irwin Miller and Marylees Miller(2012) - "Mathematical Statistics ", Seventh Edition, Pearson Publications, New Delhi.

UNIT	CHAPTER	SECTION
I	II	2.1 – 2.7
II	III	3.1 – 3.5
III	IV	4.1 – 4.6
IV	V	5.1 – 5.7
V	VI	6.1 – 6.5

REFERENCE BOOK :

1. Kapur.J.N and Saxena.H.C. (2011)- "Mathematical Statistics", 20th Edition,
    S.Chand & company, Ram Nagar, New Delhi.
2. Guptha C.B and Vijay Guptha (2008) "Introduction to Statistical methods", Vikas publishing house pvt Ltd.

BOOKS FOR REFERENCE:
1. https://libguides.reading.ac.uk
2. https://stats.stackexchange.com
3. https://zu.libguides.com

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART IV	SKILL ENHANCEMENT : I	25SEMAU01	MATHEMATICAL SOFTWARE – SPSS-PRACTICAL	36	2

Contact Hours per Week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	50	-	50

PREAMBLE:

To enable the students to learn and gain knowledge about SPSS such as Mean, Median, Mode, different types of distributions.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recognize the commands provided in the SPSS environment	K_1
CO2	Demonstrate the charts and diagrams in statistics	K_2
CO3	Classify the various kinds of distribution such as binomial distribution, Poisson distribution and normal distribution	K_3
CO4	Analyze the data which is used to find the mean, median, mode, standard deviation, variance and range	K_4
CO5	Estimate the probability distribution by using various types of distributions also SPSS database which is used to fit the straight line and plot the exponential curves.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate;

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	9	9	3	9	9	3	9
CO 2	9	9	9	9	9	3	3
CO 3	9	9	9	9	9	3	9
CO 4	9	9	9	9	9	3	9
CO 5	9	9	9	9	9	3	9
Total Contribution of COs to POs	45	45	39	45	45	15	39
Weighted Percentage of COs Contribution to POs	2.58	2.83	2.64	3.31	5.14	1.95	5.66

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation;
9- High correlation between COs and Pos

LIST OF PROGRAMS

All the following listed programs have to be executed and recorded

1. Create a SPSS database and to find Mean.
2. Create a SPSS database and to find Median and Mode.
3. Find the Standard deviation, Variance and Range by using SPSS database.
4. Find the Standard error of Mean, Maximum and Minimum by using SPSS database.
5. Create a SPSS database and to find both Pearson's and Spearman's correlation in both 1- Tailed and 2-Tailed tests.
6. Create the SPSS database to fit the Straight line and plot the Exponential curve using Regression.
7. Create a SPSS database and present that data through charts and diagrams.
8. Find the probability distribution by using Binomial distribution in SPSS.
9. Find the probability distribution by using Poisson distribution in SPSS.
10. Find the probability distribution by using Normal distribution in SPSS.

WEB REFERENCES:
1. https://www.ibm.com/in-en/analytics/spss-statistics-software

2. https://www.lib.sfu.ca/find/research-tools/spss-resources

3. https://libguides.muw.edu/psychandfamilyscience/spss

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART – IV	ABILITY ENHANCEMENT: II	25AEU02	CONSUMER RIGHTS	24	2

Contact hours per week: 2

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	50	--	50

PREAMBLE:

This paper seeks to familiarize the students with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.

COURSE OUTCOME:

After completion of the course, the learners will be able to:

COs	CO Statement	Knowledge Level
CO1	Memorize the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards	K1
CO2	Explain the Consumer Protection Law in India	K2
CO3	Impart sound practical grounding about the practice of consumer law and the procedure followed	K3
CO4	Evaluate the regulations and legal actions that helps to protect consumers	K4
CO5	Analyse the knowledge and skills needed for a career in this field	K5

K1 – Remember;   K2 – Understand;   K3 – Apply;   K4 – Analyze; K5 – Evaluate;

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	1	0	1
CO2	9	9	9	9	1	0	1
CO3	9	9	9	3	3	1	1
CO4	9	3	1	1	3	3	3
CO5	9	1	3	0	9	9	9
Total Contribution of COs to POs	45	31	31	21	17	13	15
Weighted Percentage of COs Contribution to POs	2.58	1.95	2.10	1.54	1.94	1.69	2.18

Level of correlation: 0 – No correlation;   1- Low correlation; 3 – Medium correlation;   9 – High correlation between COs and Pos

COURSE CONTENT

UNIT- I   Conceptual Framework   (5 Hours)

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology.

Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

UNIT II: The Consumer Protection Law in India   (5 Hours)

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, and National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT- III Grievance Redressal Mechanism under the Indian Consumer Protection Law

(5 Hours)

Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal; Offences and penalties. **Leading Cases decided under Consumer Protection law by Supreme Court/National Commission**: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT- IV   Role of Industry Regulators in Consumer Protection   (5 Hours)

i. Banking: RBI and Banking Ombudsman

ii. Insurance: IRDA and Insurance Ombudsman

iii. Telecommunication: TRAI

iv. Food Products: FSSAI

v. Electricity Supply: Electricity Regulatory Commission

vi. Real Estate Regulatory Authority

UNIT –V   Contemporary Issues in Consumer Affairs   (4 Hours)

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs,* Universities Press.

2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure,* Deep and Deep Publications Pvt Ltd.

3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications

4. Suresh Misra and SapnaChadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi

5. Rajyalaxmi Rao (2012), *Consumer is King,* Universal Law Publishing Company

6. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.

7. E-books :- www.consumereducation.in

8. Empowering Consumers e-book,

9. ebook, www.consumeraffairs.nic.in

10. *The Consumer Protection Act, 1986 and its later versions.* www.bis.org

Articles

1. Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India One People.

2. Raman Mittal, SonkarSumit and Parineet Kaur (2016) Regulating Unfair Trade Practices: An Analysis of the Past and Present Indian Legislative Models, Journal of Consumer Policy.

3. Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online at www.cuts-international.org/doc01.doc.

4. Kapoor Sheetal (2013) "Banking and the Consumer" Akademos (ISSN 2231-0584)

5. Bhatt K. N., Misra Suresh and ChadahSapna (2010). Consumer, Consumerism and Consumer Protection, Abhijeet Publications.

6. Kapoor Sheetal (2010) "Advertising-An Essential Part of Consumer's Life-Its Legal and Ethical Aspects", Consumer Protection and Trade Practices Journal, October 2010.

7. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.

Periodicals

1. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)

2. Recent issues of magazines: International Journal on consumer law and practice, National Law School of India University, Bengaluru

3. '*Consumer Voice*', Published by VOICE Society, New Delhi.

Websites:

www.ncdrc.nic.in
www.consumeraffairs.nic.in
www.iso.org.
www.bis.org.in
www.consumereducation.in
www.consumervoice.in
www.fssai.gov.in
www.cercindia.org

SEMESTER - V

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XIV	25MAU14	ABSTRACT ALGEBRA	72	5

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about Sets, Groups and Rings.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definition and basic ideas of Sets, Mappings, Groups, Rings and Ideals.	K_1
CO2	interpret the basic concepts of Abstract Algebra.	K_2
CO3	apply theoretical ideas of set theory and group theory for solving the simple problems .	K4
CO4	analyze the various theorems and lemmas for groups and Rings .	K_3
CO5	evaluate the simple problems of set theory ,Group theory and ring theory.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	1	1	1
Total Contribution of COs to POs	45	45	39	39	17	17	15
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.94	2.21	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: **SETS AND GROUPS**   **(12 Hours)**

Sets – Mappings – The integers.

Groups: Abelian group, Symmetric group Definitions and Examples – Basic properties.

UNIT – II: **SUB GROUPS**   **(15 Hours)**

Subgroups – Cyclic subgroup - Index of a group – Order of an element – Fermat theorem – A Counting Principle - Normal Subgroups and Quotient Groups.

UNIT – III: **HOMOMORPHISMS OF GROUPS**   **(15 Hours)**

Homomorphisms – Cauchy's theorem for Abelian groups – Sylow's theorem for Abelian groups Automorphisms – Inner automorphism - Cayley's theorem, permutation groups.

UNIT – IV: **RINGS**   **(15 Hours)**

Rings: Definition and Examples –Some Special Classes of Rings – Commutative ring – Field – Integral domain - Homomorphisms of Rings.

Field Theory and Homomorphic Encryption in Industry 5.0

UNIT – V: **IDEALS AND QUOTIENT RINGS**   **(15 Hours)**

Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of Quotients of an Integral Domain.

TEXT BOOK:

Herstein.I.N (2014)—"Topics in Algebra", 2nd edition, John Wiley & Sons, New York

UNIT	CHAPTER	SECTION
I	1,2	1.1-1.3, 2.1-2.3
II	2	2.4-2.6
III	2	2.7-2.10
IV	3	3.1-3.3
V	3	3.4-3.6

REFERENCE BOOKS:

1. Fraleigh John .B (1986) - "An I course in Abstract Algebra",Narosa Publishing House ,New Delhi Madras Bombay Calcutta.
2. Arumugam and Issac A.T (2003) - "Scitech Publishing (India) Pvt Ltd.
3. Vasishtha A.R (1994 – 95) - "Modern Algebra", Krishna Prakashan Mandir, Meerut.

WEB REFERENCES:

https://www.youtube.com/watch?v=maACVONq5IU

https://www.youtube.com/watch?v=BVf5FFIbaaQ

https://www.youtube.com/watch?v=KCSZ4QhOw0I

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjkt-bSjpfzAhV63jgGHSgfAGsQFnoECAYQAQ&url=https%3A%2F%2Fwww.slideshare.net%2FYuriyMaturin%2Fabstract-algebra-58750320&usg=AOvVaw0SOjw-8D-gD_ZB6FM2ekVH

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : XV**	**25MAU15**	**REAL ANALYSIS - I**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	**V**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn and gain knowledge about Real number system and Point set topology.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of upper bounds, lower bounds, countable sets, uncountable sets, open sets, closed sets and metric space.	K_1
CO2	Explain the concepts of upper bounds, lower bounds, countable sets, uncountable sets, open sets, closed setsand metric space.	K_2
CO3	Apply the concepts of limits for a vector – valued functions, finite and infinite sets for countable and uncountable sets, adherent points, accumulation points, interior points in open and closed sets.	K_3
CO4	Analyze the concepts of countable sets, uncountable sets, open sets, closed sets, adherent points and accumulation points.	K_4
CO5	Verify the concepts of upper bounds, lower bounds, supremum, infimum for real number system, relations, functions, Open balls, open sets, Closed sets, Adherent points and Accumulation points.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	1	3	3	3	3
CO2	9	9	1	3	3	3	3
CO3	9	9	9	9	3	9	3
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	45	45	29	33	27	33	27
Weighted Percentage of COs contribution to POs	2.58	2.83	1.97	2.42	3.08	4.29	3.92

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I : THE REAL AND COMPLEX NUMBER SYSTEMS (15 Hours)

The Real and Complex number systems : Introduction - The field axioms, the order axioms –Integers –The unique Factorization theorem for integers –Rational numbers –Irrational numbers – Upper bounds, maximum Elements, least upper bound –The completeness axiom –Some properties of the supremum – The Archimedian property of the real number system –Absolute values and the triangle inequality –The Cauchy-Schwarz inequality .

UNIT - II : BASIC NOTIONS OF SET THEORY (15 Hours)

Basic notions of set theory : Introduction - Relations and functions - Further terminology concerning functions –One –one functions and inverses –Composite functions –Sequences –Similar sets-Finite and infinite sets –Countable and uncountable sets –Uncountability of the real number system –Set algebra - Countable collection of countable sets.

UNIT – III : ELEMENTS OF POINT SET TOPOLOGY (15 Hours)

Elements of point set topology: Introduction - Euclidean space R^n –Open balls and open sets in R^n. The structure of open Sets in R^1 –Closed sets - Adherent points- Accumulation points - closed sets and adherent points -The Bolzano Weierstrass theorem – The Cantor intersection Theorem.

UNIT – IV: ELEMENTS OF POINT SET TOPOLOGY (15 Hours)

Covering –Lindelof covering theorem –the Heine Borel covering theorem –Compactness in R^n –Metric Spaces –Point set topology in metric spaces –Compact subsets of a metric space – Boundary of a set.

UNIT – V : LIMITS (12 Hours)

Limits: Introduction - Convergent sequences in a metric space –Cauchy sequences – Complete metric Spaces. Limit of a function - Limit of a vector valued functions.

TEXTBOOK

APOSTOL.T.M – (2002) "Mathematical Analysis", 2nd edition, 20th Reprint., Addison-Wisely, Narosa Publishing Company, Chennai.

UNIT	CHAPTER	SECTION
I	1	1.1-1.3, 1.6-1.12, 1.14, 1.18, 1.19
II	2	2.1, 2.5-2.15
III	3	3.1-3.9
IV	3	3.10-3.16
V	4	4.1- 4.5, 4.7

REFERENCE BOOKS

1. Goldberg.R.R –(1990), "Methods of Real Analysis", NY, John Wiley, New York.
2. Simmons.G.F – (1963), "Introduction to Topology and Modern Analysis", McGraw – Hill, New York.

WEB REFERENCES:

1. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/
2. https://www.jirka.org/ra/
3. https://www.macalester.edu/aratra/

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : XVI**	**25MAU16**	**COMPLEX ANALYSIS- I**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	**V**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn complex functions, mappings and complex integration.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of complex functions, power series, simple mappings and complex integration.	K_1
CO2	explain the differentiability and analyticity of complex functions, properties of complex function, convergence of power series, conformal mapping and contour integrals.	K_2
CO3	apply the theorem and results to solve a variety of problems arising in analytic function.	K_3
CO4	analyze the linear transformations, conditions for differentiability, conformal mapping and convergence of power series.	K_4
CO5	evaluate integrals of analytic functions and the effect of various transformations and mappings.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate.**

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	1
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	1	1	1
CO5	9	9	9	3	1	1	0
Total Contribution of COs to POs	45	45	45	39	11	11	6
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	2.87	1.26	1.43	0.87

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I   **COMPLEX NUMBER SYSTEM**   **(12 Hours)**

Complex number –Field of Complex numbers – Conjugation –Absolute value -Argument –Simple Mappings. i) w =z +α ii) w = az iii) w =1/z - invariance of cross-ratio under bilinear transformation –Definition of extended complex plane – Stereographic projection.

UNIT - II   **ANALYTIC FUNCTIONS**   **(15 Hours)**

Limit of a function –Continuity –Differentiability – Analytical function defined in a region –Necessary conditions for differentiability –Sufficient conditions for differentiability –Cauchy-Riemann equation in polar coordinates –Complex function as a function of z and $\overline{z}$

UNIT - III   **POWER SERIES AND ELEMENTARY FUNCTIONS**   **(15 Hours)**

Absolute convergence –Circle of convergence –Analyticity of the sum of power series in the Circle of convergence (term differentiation of a series) Exponential, Logarithmic, Trigonometric and Hyperbolic functions.

UNIT - IV   **ELEMENTARY ANDCONFORMAL MAPPING**   **(15 Hours)**

Conjugate Harmonic functions: Definition and determination, Conformal Mapping: Isogonal mapping –Conformal mapping-Mapping z→f(z), where f is analytic, particularly the Mappings: w= e^z ; w = $z^{1/2}$; w=sin z, w=cos z

UNIT - V   **COMPLEX INTEGRATION**   **(15 Hours)**

Simply and multiply connected regions in the complex plane. Integration of f(z) from definition along a curve joining z_1 and z_2. Proof of Cauchy's Theorem (using Goursat's lemma for a simply connected region). Cauchy's integral formula for higher derivatives (statement only)-Morera's theorem.

TEXT BOOK:

Duraipandian.P and Kayalal Pachaiyappa (2014) ," Complex analysis", S.Chand & Company PVT.Ltd. New Delhi.

UNIT	CHAPTER	SECTION
I	1	1.1 to 1.3, 1.6 to 1.9
	2	2.1 , 2.6 to 2.10,
	7	7.1& 7.10
II	4	4.1 to 4.10
III	6	6.1 to 6.11
IV	6	6.12 to 6.13
	7	7.5 to 7.9
V	8	8.1 to 8.9& 8.13

REFERENCE BOOKS:

1. Pillai.T.K.M. & Narayanan.S (1997)" Complex Analysis ", S.Viswanathan pvt ltd – Chennai.

2. Sharma.J.N. (2016),"Complex Analysis", Krishan Prakashan Media – Meerut.

WEB REFERENCES:

https://nptel.ac.in/courses/111/103/111103070/

https://nptel.ac.in/courses/111/107/111107056/

https://nptel.ac.in/courses/122/103/122103012/

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XVII	25MAU17A / 25MAU17B/ 25MAU17C	INSTITUTIONAL TRAINING / INDUSTRIAL TRAINING/ MINI PROJECT	-	1

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	100	-	100

PREAMBLE:

To enable the students to learn and gain knowledge about their principal areas of study.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts related to the project work	K_1
CO2	illustrate the knowledge about their principal areas of project work	K_2
CO3	applying the relative notions in the respective areas and finding the results	K_3
CO4	analyzing results with the existing results	K_4
CO5	interpreting the results with suitable examples	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	33	33	33
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	3.77	4.29	4.79

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : XIX ELECTIVE : I**	**25MAU18A**	**OPERATIONS RESEARCH - I**	**60**	**4**

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	**V**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn decision making problems based on deterministic and probabilistic models.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	outline the meaning, purpose and tools of Linear programming, Transportation, Assignment and Replacement models.	K_1
CO2	explain the procedures for Linear programming, Transportation, Assignment and Replacement Theory.	K_2
CO3	illustrate the methodologies to get the optimal solution and the period of replacement.	K_3
CO4	measure the mathematical background of Linear programming, minimum Transportation cost, Assignment techniques and the mechanism behind the sudden failure of systems.	K_4
CO5	evaluate different situations after the solution of Linear programming, Transportation, Assignment and Replacement models.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.58	2.45	2.24	2.28	2.51	2.86	3.19

**Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs**

COURSE CONTENT:

UNIT – I :   **LINEAR PROGRAMMING PROBLEM**   **(12 Hours)**

Introduction- Linear Programming Problem - Mathematical formulation of the problem– Illustrations on Mathematical formulation of LPP's-Graphical method.

UNIT – II : SIMPLEX METHOD AND ARTIFICIAL VARIABLE TECHNIQUE (12 Hours)

Principles of Simplex method-Use of Artificial Variables-Two phase method- Big M method

UNIT – III: **TRANSPORTATION PROBLEM**   **(12 Hours)**

Solution of a Transportation problem- Finding an IBFS- Test for Optimality- MODI Method-Some Exceptional Cases.

UNIT – IV :   **ASSIGNMENT PROBLEM**   **(12 Hours)**

Introduction-Mathematical Formulation of the Problem- Solution methods of Assignment Problem-Special Cases in Assignment Problem.

UNIT – V :   **REPLACEMENT**   **(12 Hours)**

Introduction - Replacement of equipment / assets that deteriorates gradually - Replacement of equipment that fails suddenly and problems.

Industry 4.0 *– Solving optimization Problems using R.*

1. Write a R program to solve the following LPP

	Customer 1	Customer 2	Customer 3	Customer 4	Supply
Supplier 1	10	2	20	11	15
Supplier 2	12	7	9	20	25
Supplier m	4	14	16	18	10
Demand	5	15	15	15	

2. Consider a nutrition chart with cost and calories. Write a program in R to find the minimum –cost   diet.

3. There are three plants A, B, and C with capacities of 120, 80 and 200 units. They supply to four warehouses P, Q, R, and S with demand of 60, 50, 140 & 50 units. Find IFS by VAM. Also write coding in R. Transportation unit cost matrix is given below:

Warehouse / Plant	P	Q	R	S
A	3	5	2	5
B	3	8	4	8
C	7	4	7	4

4. Write a programming in R to solve the following assignment problem

Temporary Employee	Required Time per Task (Hours)				Hourly Wage
	Word Processing	Graphics	Packets	Registrations	
Ann	35	41	27	40	$14
Ian	47	45	32	51	12
Joan	39	56	36	43	13
Sean	32	51	25	46	15

TEXT BOOK:

Kantiswarup, P. K. Gupta, Man Mohan (2017) –" Operations Research", 18th Revised edition, S. Chand & Sons Education Publications, New Delhi.

UNIT	CHAPTER	PAGE
I	2 3 4	39-46 65-78 99-105
II	4	106-114
III	10	252-281
IV	11	295-311
V	18	477-495

REFERENCE BOOKS:

1. DharaniVenkata Krishnan .S – " Operations Research Principles and Problems" Keerthi publishing house PVT Ltd.

2. Prem Kumar Gupta D. S. Hira – "Operations Research " , S. Chand & Company Ltd, Ram Nagar, New Delhi.

WEB REFERENCES:

https://www.youtube.com/watch?v=Hw2CP_4iK4U

https://www.youtube.com/watch?v=vKVkOpNDZ2s

https://www.slideshare.net/mplad/two-phase-method-linear-programming

Category	Component	Course	Course Title	Contact Hours/ Semester	Credits

		Code			
PART III	**CORE : XIX ELECTIVE : I**	**25MAU18A**	**MATHEMATICAL MODELLING - I**	**60**	**4**

Contact Hours per Week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	**V**	**25**	**75**	**100**

PREAMBLE:

　　　　To enable the students to apply mathematical techniques for formulating, analyzing, and solving real-world problems through modelling.

　　COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of mathematical modeling and list its characteristics and techniques.	K_1
CO2	Explain linear growth and decay models and describe how compartment models work.	K_2
CO3	Apply systems of first-order differential equations to model population dynamics and epidemics.	K_3
CO4	Analyze mathematical models of planetary motion and circular motion using second-order differential equations.	K_4
CO5	Develop and solve difference equation models for real-world systems, such as population or economic models.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.58	2.45	2.24	2.28	2.51	2.86	3.19

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;

9- High Correlation between COs and POs

COURSE CONTENT:

UNIT- I: NEEDS AND TECHNIQUES   **(12 Hours)**

Simple situations requiring mathematical modeling - The Technique of mathematical modeling   – Classification of mathematical models – Some characteristics of mathematical models.

UNIT – II: MODELING USING FIRST-ORDER EQUATIONS   **(12 Hours)**

Mathematical modeling through differential equations -Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models.

UNIT –III: FIRST-ORDER DIFFERENTIAL MODELS   **(12 Hours)**

Mathematical modelling in population dynamics-mathematical modelling of epidemics through systems of ordinary differential equations of first order-compartment models through systems of ordinary differential equations.

UNIT- IV: SECOND-ORDER EQUATION MODELLING   **(12 Hours)**

Mathematical modelling of planetary motions-mathematical modelling of circular motion and motion of satellites.

UNIT- V: DIFFERENCE EQUATIONS IN MODELLING   **(12 Hours)**

The need for mathematical modelling through difference equations :some simple models- basic theory of linear difference equations with constant coefficients.

TEXT BOOK :

"MATHEMATICAL MODELLING" by J.N.Kapur, John Wiley & Sons, Newyork.

UNIT	CHAPTER	SECTION	PG NO
I	I	1.1-1.4	1-13
II	II	2.1-2.4	30-42
III	III	3.1-3.4	53-64
IV	IV	4.1-4.3	76-87
V	V	5.1-5.2	96-104

REFERENCE BOOKS :

1. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002
2. Mathematical Modeling by Bimalk. Mishra and Dipak K.Satpathi. Ane Books Pvt. Ltd(1 January 2009)

WEB REFERENCES:

https://people.math.aau.dk/~cornean/IMM_E12/notes2011a.pdf
https://www.math.ruh.ac.lk/~pubudu/mode2.pdf
https://www-users.york.ac.uk/~pjh503/mathematical_model/math_model10.pdf
https://onlinecourses.nptel.ac.in/noc22_ma20/preview
https://www.youtube.com/watch?v=-wVCKOvceok

Category	Course Type	Course Code	Course Title	Contact Hours	Credits
PART IV	SKILL ENHANCEMENT : II	25SEMAU02	DATA ANALYSIS USING GEOGEBRA - PRACTICAL	36	2

Contact Hours per Week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	50	-	50

PREAMBLE:

    To enable the students to learn and gain knowledge about different mathematical software.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Perform fundamental mathematical operations on numbers.	K_1
CO2	compute statistical measures such as mean, median, mode, variance, and standard deviation.	K_2
CO3	Construct and interpret graphs of derivatives, evaluate definite integrals, and calculate area under curves using Riemann sums and between two functions.	K_3
CO4	Draw and analyze geometric figures such as polygons, angles, parallel and perpendicular lines, tangents, and conical curves.	K_4
CO5	Classify geometric shapes, compute areas and centroids of polygons and composite figures using appropriate mathematical and graphical methods.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;**
K_5 – **Evaluate;** K_6 – **Create**.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	3	5	3
CO5	9	9	9	9	3	3	1
Total Contribution of COs to POs	45	45	45	45	33	35	31
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	3.77	4.55	4.50

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

LIST OF PROGRAMS

All the following listed programs have to be executed and recorded.

1. Write a program to illustrate the basic operations on numbers using Geogebra. (sum, product, HCF, n^{th} term etc).
2. Write a program to illustrate the basic operations on matrices.
3. Find the calculation of measures of central tendency and dispersion using Geogebra.
4. Write a program to construct the curve of $f^{'}(x)$ and finding definite integrals.
5. Write a program to calculate the area under a graph using Riemann sum method and area between two curves using Geogebra.
6. Write a program to draw polygons and angles (square, rectangles, kites, parallelograms etc)
7. Write a program to draw parallel, perpendicular lines and tangents.
8. Write a program to classifying polygons and finding the area of polygons using Geogebra.
9. Write a program to create a calculation of centroids using Geogebra.
10. Write a program to draw conical curves using Geogebra.

WEB REFERENCES:

1. https://www.scribd.com/document/796021925/GeoGebra-in-10-Lessons-Gerrit-Stols
2. https://www.geogebra.org/m/d6fgpny2
3. https://www.wiley.com/en-us/Mathematical+Modeling%3A+Applications+with+GeoGebra-p-9781119102724

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART V	PROFICIENCY ENHANCEMENT	25PEMAU01	NUMERICAL APTITUDE (SELF STUDY)	-	2

Contact hours per week: -

Year	Semester	Internal Marks	External Marks	Total Marks
III	V	-	100	100

PREAMBLE:

To enable the students to learn about the concepts of aptitude.

COURSE OUTCOME:

On the successful completion of the course students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the formulae in numerical aptitude	K_1
CO2	explain the procedure for solving the problems numerically.	K_2
CO3	apply various formulae to obtain the numerical solutions.	K_3
CO4	analyze the problems based on Ages and percentage.	K_4
CO5	evaluate the solutions of simple problems on numbers , ages and percentage.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	1	3	3
CO4	9	9	9	9	1	3	3
CO5	9	9	9	9	0	3	3
Total Contribution of COs to POs	45	45	45	45	8	27	15
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	0.91	3.51	2.18

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT:

UNIT I :

Numbers - H.C.F and L.C.M of Numbers - Simplification

UNIT II :

Square roots and Cube roots.

UNIT III :

Problem on Numbers.

UNIT IV :

Problem on Ages.

UNIT V :

Percentage - Concept of percentage.

TEXT BOOK:

Aggarwal R.S. (2012 Edition), Quantitative Aptitude for Competitive Examinations, S. Chand & Company Ltd, New Delhi

REFERENCE BOOKS:

1. Sijwali B. S.(2007), Quantitative Aptitude,Arihand Publications (India) PVT LTD.

2. AbhijitGuha(2006), Quantitative Aptitude for Competitive Examinations, McGraw Hill

   Companies.

SEMESTER – VI

Category	Course Type	Course Code	Course Title	Contact Hours	Credit
PART III	**CORE : XX**	**25MAU19**	**LINEAR ALGEBRA**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	**VI**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn and gain knowledge about linear algebra and linear transformations.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions and preliminaries in Vector space, Basis, Dual spaces, Inner product spaces.	K_1
CO2	explain the basic concepts of Linear Algebra	K_2
CO3	apply conceptual ideas of Linear Algebra in simple problems.	K_3
CO4	analyze the theorems and inequalities on linear functions and linear functional .	K_4
CO5	evaluate the characterization of linear vectors, linear transformations and linear functional.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	1	1	1
Total Contribution of COs to POs	45	45	39	39	17	17	17
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.94	2.21	2.47

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: VECTOR SPACES AND SUBSPACES **(15 Hours)**

Group-Field-External and Internal compositions-Linear Algebra-Definition-Subspaces-Linear Combination-Linear Span-Linear Sum-Internal Direct Sum- Complementary Subspaces-Disjoint Spaces-External Direct Sum-Quotient Space-Elementary Properties-Theorems related to vector spaces, Subspaces and Linear Span

UNIT – II: LINEAR DEPENDENCE OF VECTORS AND BASIS **(15 Hours)**

Vector-Zero vector -Operation on vector –Vectors in C^n and R^n-Linearly dependent and Linearly independent-Basic theorems regarding linear dependent of vectors-Cauchy Schwarz's inequality-Minkowski's inequality.

Basis–Finitely generated spaces-Dimension co-ordinates-Existence theorem–Replacement theorem-Invarience of number of elements in a basis-Extension theorem-Theorems related to basis and dimension.

Dimensionality Reduction for IoT Data Compression 5.0.

UNIT – III: LINEAR TRASFORMATIONS **(15 Hours)**

Trasformations-Onto and into maps-One –one and many-one maps-Products of functions-Linear transformation-Isomorphisms-Kernal and range space of a linear map-Nulity and rank-Singular and non-singular transformation-linear operator-Invertible operator-Some theorems.

UNIT – IV: LINEAR FUCTIONALS AND THE DUAL SPACE **(15 Hours)**

Linear functional and its examples-Dual space- Dual basis-Reflexivity-Annihilator-Transpose of a linear map-Theorems.

UNIT – V: INNER PRODUCT SPACES **(12 Hours)**

Inner product-Norm-orthogonality-orthogonal and orthonormal sets-Angle between two vetors-Adjoint operator-Complete orthonormal set-Symmetric operator-T-invariant-Theorem and solved examples-Bessel's inequality-Grahm Schmidt orthogonalization process.

Industry 4.0 – Foundations for Data Science Machine Learning.

1. https://youtu.be/5qj8krSCezw

2. https://youtu.be/wyoS89J3ap4

TEXT BOOK

Gupta.K. P.(1988) "Linear algebra", Pragathi Prakashan Publishers , Meerut India limited.

UNIT	CHAPTER	PAGE NUMBER
I	2	6-26
II	3,4	48-57 , 73-91
III	5	111-136
IV	7	207- 232
V	10	273-296

REFERENCE BOOKS

1. Herstein.I.N(2014)—"Topics in Algebra", II Edition, John Wiley & Sons, New York.

2. Sharama S. D - "Linear algebra" Kedarnath ramnath Publishers, Meerut.

3. Vasishtha A. R(1994 – 95)—"Modern Algebra", Krishna Prakashan Mandir, Meerut.

WEB REFERENCES:

1. https://youtu.be/t5ckUuSsWe4

2. https://www.youtube.com/watch?v=ozwodzD5bJM

3. https://www.youtube.com/watch?v=j3YpNG1oBMo

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : XXI**	**25MAU20**	**REAL ANALYSIS - II**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	**VI**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn and gain knowledge about Continuity, Derivatives and Functions of Bounded variation.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the definitions of continuous functions, uniform continuous functions, connectedness, derivatives and monotonic functions.	K_1
CO2	explain the concepts of continuous functions, uniform continuous functions, connectedness, derivatives and monotonic functions.	K_2
CO3	Apply the concepts of monotonic functions for the functions of bounded variations, total variations, Continuity and inverse images of open or closed sets.	K_3
CO4	Analyze the concepts of continuity, uniform continuity, bounded variations, total variations.	K_4
CO5	Evaluate the problems based on Chain Rule, Rolles Theorem, Mean Value Theorem and Fixed Point Theorem.	K_5

K_1 **- Remember;** K_2 **– Understand;** K_3 **- Apply;** K_4 **- Analyze;** K_5 **– Evaluate**.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	1	3	3	3	3
CO2	9	9	1	3	3	3	3
CO3	9	9	9	9	3	9	3
CO4	9	9	9	9	9	9	9
CO5	9	9	9	9	9	9	9
Total Contribution of COs to POs	45	45	29	33	27	33	27
Weighted Percentage of COs contribution to POs	2.58	2.83	1.97	2.42	3.08	4.29	3.92

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I :   **CONTINUITY**   **(15 Hours)**

Continuous functions –Continuity of composite functions– Examples of continuous functions - Continuity and inverse images of open or closed sets – Functions continuous on compact sets.

UNIT – II :   **CONTINUITY**   **(12 Hours)**

Connectedness –Components of a metric space – Uniform continuity : Uniform continuity and compact sets –Fixed point theorem for contractions – Monotonic functions.

UNIT - III :   **DERIVATIVES**   **(15 Hours)**

Introduction - Definition of derivative –Derivatives and continuity –Algebra of derivatives – the chain rule —Rolle's theorem –The mean value theorem for derivatives – Intermediate value theorem for derivatives - Taylor's formula with remainder.

UNIT – IV :   **FUNCTIONS OF BOUNDED VARIATION**   **(15 Hours)**

Introduction -Properties of monotonic functions –Functions of bounded variation –Total Variation – Additive properties of total variation - Total variation on [a, x] as a function of x – Functions of bounded variation expressed as the difference of increasing functions.

UNIT – V :   **RIEMANN – STIELTJES INTEGRAL**   **(15 Hours)**

The Riemann - Stieltjes integral : Introduction –Notation –The definition of Riemann –Stieltjes integral –Linear properties –Integration by parts –Change of variable in a Riemann –Stieltjes integral –Reduction to a Riemann integral.

TEXTBOOK:

Apostol T.M – (2002) "Mathematical Analysis", 2nd edition, 20th Reprint., Addison-Wisely, Narosa Publishing Company, Chennai.

UNIT	CHAPTER	SECTION
I	4	4.8 - 4.9, 4.11 - 4.13
II	4	4.16, 4.17, 4.19 - 4.21, 4.23.
III	5	5.1 - 5.5, 5.9 - 5.12.
IV	6	6.1- 6.7.
V	7	7.1 - 7.7

REFERENCE BOOKS:

1. Goldberg.R.R –(1990), "Methods of Real Analysis", NY, John Wiley, New York.

2. Simmons.G.F – (1963), "Introduction to Topology and Modern Analysis", McGraw – Hill, New York.

WEB REFERENCES:

1. http://assets.press.princeton.edu

2. https://mathcs.org/analysis/reals

3. https://bookstore.ams.org

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE : XXII**	**25MAU21**	**COMPLEX ANALYSIS – II**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
III	**VI**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn the immediate consequence of Cauchy's theorem, analytic and meromorphic functions and contour integration.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the results of Cauchy's theorem, Taylor's and Laurent's series, singularities, residues and meromorphic function.	K_1
CO2	describe the results based on Cauchy's theorem, singularities, residues and meromorphic function.	K_2
CO3	examine the singularities, poles and residues of complex function, types of real definite integrals.	K_3
CO4	analyze the Taylor's and Laurent's expansion, behavior of a function at an isolated singularity and zeros and poles of meromorphic function.	K_4
CO5	evaluate the series expansion and roots of analytic functions and the real definite integrals.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	1
CO2	9	9	9	9	3	3	1
CO3	9	9	9	9	3	3	1
CO4	9	9	9	3	1	1	1
CO5	9	9	9	3	1	0	0
Total Contribution of COs to POs	45	45	45	33	11	10	4
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	2.42	1.26	1.30	0.58

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT - I :   **RESULTS BASED ON CAUCHY'S THEOREM (I)**   **(15 Hours)**

Zeros of a function -Cauchy's Inequality – Lioville's theorem –Fundamental theorem of algebra –Maximum modulus theorem –Gauss mean value theorem –Gauss mean value theorem for a harmonic function on a circle.

UNIT – II :   **RESULTS BASED ON CAUCHY'S THEOREM (II)**   **(15 Hours)**

Taylor's series – Laurent's series.

UNIT – III: **SINGULARITIES AND RESIDUES**   **(15 Hours)**

Singular point - Isolated singularities (Removable Singularity, pole and essential singularity) –Residues –Residue theorem.

UNIT – IV: **REAL DEFINITE INTEGRALS**   **(15 Hours)**

Evaluation using the calculus of residues – Integration on the unit circle –Integral with $-\infty$ and $+\infty$ as lower and upper limits with the following integrals:

i) $P(x) / Q(x)$ where the degree of $Q(x)$ exceeds that of $P(x)$ at least by 2.

ii) $(\sin ax).f(x)$, $(\cos ax).f(x)$, where $a>0$ and $f(z) \to 0$ as $z \to \infty$ and $f(z)$ does not have a pole on the real axis.

iii) $f(x)$ where $f(z)$ has a finite number of poles on the real axis.

Integral of the type $\int_x^{a-1} \frac{x}{1+x} dx$; $0< a <1$;

UNIT – V: **MEROMORPHIC FUNCTIONS**   **(12 Hours)**

Theorem on number of zeros minus number of poles –Principle of argument: Rouche's theorem – Theorem that a function which is meromorphic in the extended plane is a rational function.

TEXT BOOK:

Duraipandian.P and Kayalal Pachaiyappa(2114), "Complex Analysis", S.Chand and Company pvt.ltd, New Delhi.

UNIT	CHAPTER	SECTION
I	8	8.10, 8.11
II	9	9.1 to 9.3, 9.13.
III	9	9.5 to 9.12, 9.13.
	10	10.1, 10.2 and 10.4.
IV	10	10.3 and 10.4.
V	11	11.1 to 11.3 (Omit theorems 11.5 and 11.6)

REFERENCE BOOKS:

1. Pillai.T.K.M. & Narayanan.S (1997) " Complex Analysis ", S.Viswanathan pvt ltd – Chennai.

2. Sharma.J.N. (2016),"Complex Analysis", Krishan Prakashan Media – Meerut.

WEB REFERENCES:

https://nptel.ac.in/courses/111/103/111103070/

https://nptel.ac.in/courses/111/106/111106094/

https://nptel.ac.in/courses/122/103/122103012/

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XXIII ELECTIVE : II	25MAU22A	OPERATIONS RESEARCH - II	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to understand various mathematical applications in industries-Decision making for real time environment.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts, models and statements of Integer programming, Sequencing, Dynamic Programming, level of information and NLPP	K_1
CO2	express the procedures and steps for Integer programming, Sequencing, Dynamic Programming, Information theory and NLPP	K_2
CO3	examine the pure integer values, order of jobs, optimal solution and the level of information transmission	K_3
CO4	inspect the Kuhn-Tucker conditions, optimality and the time to complete the jobs	K_4
CO5	measure the mathematical arguments in a logical manner, Dynamic programming model and its applications in industry	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.58	2.45	2.24	2.28	2.51	2.86	3.19

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT-I: **INTEGER PROGRAMMING PROBLEM**   **(14 Hours)**

Introduction –pure and mixed IPP – Gomory's all IPP method – Fractional cutmethod – All integer LPP- Mixd integer LPP.

UNIT-II :   **SEQUENCING PROBLEMS**   **(12 Hours)**

Introduction-Problem of sequencing - Basic terms used in sequencing- Processing n-jobs through 2 machines - Processing n –jobs through k machines - Processing 2 jobs through k machines (Problems only).

UNIT-III :   **DYNAMIC PROGRAMMING PROBLEM**   **(10 Hours)**

Dynamic Programming Problem – Recursive equation approach – D.P.P Algorithm – Solution of L.P.P by D.P.P.

UNIT-IV: **NON-LINEAR PROGRAMMING PROBLEMS**   **(12 Hours)**

Formulating Non-linear Programming Problems – General NLPP – Lagrange multiplier – Hessian bordered Matrix – Kuhn Tucker Condition – Problems.

UNIT-V :   **INFORMATION THEORY**   **(12 Hours)**

Introduction – A measure of information – Entropy – the expected information – some properties of entropy functions – Joint and conditional entropies.

TEXT BOOK:

Kandiswarup, P. K. Gupta, Man Mohan (2017) –" Operations Research",18th Revised edition, S. Chand & Sons Education Publications, New Delhi.

UNIT	CHAPTER	PAGE
I	7	177 – 188
II	12	327-341
III	13	347-353
IV	27	823-840 894 & 895 901 - 903
V	30	885 – 903

REFERENCE BOOKS:

1. DharaniVenkata Krishnan .S – "Operations Research Principles and Problems" Keerthi publishing house PVT Ltd.

2. Prem Kumar Gupta D. S. Hira – "Operations Research ", S. Chand & Company Ltd, Ram Nagar, New Delhi.

WEB REFERENCES:

https://www.youtube.com/watch?v=5_Xyp7NZVxU

https://www.youtube.com/watch?v=EwcjyxuwUkI

https://www.slideshare.net/hakeemrehman/integer-programming-68158750

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART - III	CORE : XXIII ELECTIVE : II	25MAU22B	MATHEMATICAL MODELLING - II	60	4

Contact Hours per Week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to apply mathematical techniques for formulating, analyzing, and solving real-world problems through modelling.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Define partial differential equations and their use in mathematical modeling.	K_1
CO2	Explain how mathematical models can be represented using directed and signed graphs.	K_2
CO3	Apply weighted and unoriented graphs to solve real-world modeling problems.	K_3
CO4	Analyze a real-world problem and formulate it as a functional or integral equation.	K_4
CO5	Develop a mathematical model using calculus of variations and dynamic programming to optimize a system.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	9	3	3	1	0	0	0
Total Contribution of COs to POs	45	39	33	31	22	22	22
Weighted Percentage of COs contribution to POs	2.58	2.45	2.24	2.28	2.51	2.86	3.19

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT- I : MODELLING USING PDE   **(12 Hours)**

Situations giving rise to partial differential equation models-mass balance equations: first method of getting PDE models-Momentum-balance equations: The second method of obtaining partial differential equation models.

UNIT - II : MODELLING WITH GRAPHS   **(12 Hours)**

Situations that can be modelled through graphs-mathematical models in terms of directed graphs-mathematical models in terms of signed graphs.

UNIT –III : MODELLING WITH GRAPHS (Cont..)   **(12 Hours)**

Mathematical modeling in terms of weighted graphs-mathematical modeling in terms of unoriented graphs.

UNIT- IV : MODELLING USING FUNCTIONAL EQUATIONS   **(12 Hours)**

Mathematical modeling through functional equations-mathematical modeling through integral equations.

UNIT- V : CALCULUS OF VARIATIONS IN MODELLING   **(12 Hours)**

Optimization principles and techniques -mathematical modeling through calculus of variations.

TEXT BOOK :

"MATHEMATICAL MODELLING" by J.N.Kapur, John Wiley & Sons, Newyork.

UNIT	CHAPTER	SECTION	PAGE NO.
I	VI	6.1-6.3	124-136
II	VII	7.1-7.3	151-164
III	VII	7.4-7.5	164-175
IV	VIII	8.1-8.2	177-192
V	IX	9.1-59.2	201-213

REFERENCE BOOKS :

1. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002
2. Mathematical Modeling by Bimalk. Mishra and Dipak K.Satpathi. Ane Books Pvt. Ltd(1 January 2009)

WEB REFERENCES:

https://cage.ugent.be/~ms/tea/PDEs/eerste_hoofdstuk.pdf

https://www.stats.ox.ac.uk/~cucuring/CDT_15_Clustering_Signed_Directed_FoDS.pdf

https://www.open.edu/openlearn/mod/resource/view.php?id=72745

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XXIV ELECTIVE : III	25MAU23A	GRAPH THEORY	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to learn and gain knowledge about Graph Theory.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall fundamentals of Graph Theory	K_1
CO2	demonstrate the concepts of graph theory	K_2
CO3	apply algorithms and procedures to solve the problems.	K_3
CO4	analyze the contexts in simple, directed, bipartite , planar, Eulerian and Hamiltonian graphs	K_4
CO5	evaluate the characterization of the graphs	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.14	1.30	1.45

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: **BASICS OF GRAPHS**   **(10 Hours)**

Graphs –Sub graphs – Degree of a vertex walks, paths and cycles in a Graphs –

connectedness- cut vertex and cut edge.

UNIT – II: EULERIAN, HAMILTONION AND BIPARTITE GRAPHS   (10 Hours)

Euler and Hamiltonion Graphs – Algorithm for Eulerian circuits –Weighed graphs- Bipartite

Graphs –Trees.

UNIT- III: MATRICES AND VECTOR SPACES ASSOCIATED WITH GRAPHS   (10 Hours)

Matrix representation of a graph – Vector spaces associated with a graph – Cycle spaces and

cut set space.

UNIT- IV: **PLANAR GRAPHS**   **(9 Hours)**

Planar graphs – Euler's theorem on planar graphs – Characterization of planar graphs (no

proof) of the difficult part of the characterization.

UNIT – V: **DIRECTED GRAPHS**   **(9 Hours)**

Directed graphs – Connectivity – Eulerion Digraphs – Tournaments.

TEXT BOOK:

Choudum.S. A.(1987) "A I Course in Graph Theory", Macmillan Publishers India limited.

UNIT	CHAPTER	SECTIONS
I	1	1.1- .7
II	2,3	2.1-2.4, 3.1&3.3
III	4	4.1- 4.4
IV	5	5.1, 5.2 & 5.5
V	7	7.1, 7.2, 7.4& 7.5

REFERENCE BOOKS:

1. Narasingh Deo,(1995) -"Graph Theory", Prentice Hall of India.
2. Harary(1988) -"Graph Theory", Narosa Publishing HQCK.

WEB REFERENCES:

1. https://www.tutorialspoint.com/graph_theory/graph_theory_fundamentals.htm
2. https://www.tutorialspoint.com/graph_theory/graph_theory_traversability.htm
3. https://en.wikipedia.org/wiki/Planar_graph

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE : XXIV ELECTIVE : III	25MAU23B	FUZZY MATHEMATICS	48	3

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total Marks
III	VI	25	75	100

PREAMBLE:

To enable the students to learn the fuzzy set theory, fundamentals of fuzzy algebra.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of fuzzy algebra.	K_1
CO2	Interpret the theoretical ideas of fuzzy algebra.	K_2
CO3	apply the concepts of fuzzy subsets, fuzzy mappings, fuzzy relations, fuzzy logic, fuzzy groups, fuzzy rings on simple problems.	K_3
CO4	analyze fuzzy subgroup and Preimage of subgroupiod.	K_4
CO5	evaluate the features of fuzzy subsets, fuzzy mappings, fuzzy relations, fuzzy logic, fuzzy groups, fuzzy rings.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs contribution to POs	2.58	2.83	2.64	2.87	1.14	1.30	1.45

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT:

UNIT – I: (10 Hours)

Introduction – Fuzzy subsets – Lattices and Boolean algebras – L fuzzy sets – operations on fuzzy – α level sets – properties of fuzzy subsets.

UNIT – II: (10 Hours)

Algebraic product and sum of two fuzzy subsets – properties satisfied by Addition and product – Cartesian product of fuzzy subsets.

UNIT – III: (10 Hours)

Introduction – Algebra of fuzzy relations – logic – connectives.

UNIT – IV: (9 Hours)

Some more connectives – Introduction – fuzzy subgroup – homomorphic image and preimage of subgroupoid.

UNIT – V: (9 Hours)

Fuzzy invariant subgroups - fuzzy subrings.

TEXTBOOK

S. Nanda and N.R. Das Fuzzy Mathematical Concepts, Narosa Publishing House, New Delhi, 2010.

UNIT	CHAPTER	PAGE NUMBER
Unit - I	Chapter 1	Section: 1.1, 1.2, 1.4, 1.5, 1.7, 1.9, 1.10.
Unit – II	Chapter 1	Section : 1.11 – 1.13
Unit - III	Chapter 2	Section : 2.1 – 2.4
Unit - IV	Chapter 2 & 3	Section : 2.5 & 3.1 – 3.3
Unit - V	Chapter 3	Section : 3.4, 3.5

REFERENCE BOOK

1. M.Ganesh, Introduction to Fuzzy sets & Fuzzy logic, Prentice Hall of India Pvt. Ltd.,

2. John N. Mordeson and Premchand S. Nair, Fuzzy Mathematics, Spring verlong, 2001.

WEB REFERENCES:

1.   https://youtu.be/LUz-FbwPh3Q

2.   https://youtu.be/IZWTduVCrf8

3.   https://en.wikipedia.org/wiki/Fuzzy_mathematics

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART IV	**SKILL ENHANCEMENT : III**	**25SEMAU03**	**LATEX PRACTICAL**	**36**	**2**

Contact hours per week: 3

Year	Semester	Internal Marks	External Marks	Total Marks
III	**VI**	**50**	**-**	**50**

PREAMBLE:

To enable the students to get experienced about Typesetting Latex

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Memorize the commands and environments provided in Latex	K_1
CO2	Express the mathematical formulae, equations and tables	K_2
CO3	Demonstrate various environments	K_3
CO4	Analyze different document types	K_4
CO5	Construct different types of documents and latex beamer presentation	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	9	9	9
CO2	9	9	9	9	9	9	9
CO3	9	9	9	9	9	9	9
CO4	9	9	9	9	3	5	3
CO5	9	9	9	9	3	3	1
Total Contribution of COs to POs	45	45	45	45	33	35	31
Weighted Percentage of COs contribution to POs	2.58	2.83	3.05	3.31	3.77	4.55	4.50

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

LIST OF PRACTICAL

1. Using Latex, type a document in different ways (Left, Right, Center, Justify)

2. Using Latex environment, type the following text

(a) Numbering 1

- Bullet 1

- Bullet 2

(b) Numbering 2

i.   Type 3

3. Using Latex environment, type the following text

1 Modern Algebra

    1.1   Group

        1.1.1 Subgroup

    1.2   Ring

        1.2.1 Homomorphism

4. Using Latex, type your own Curriculum Vitae.

5. Create the following table using LATEX:

S.No.	Register Number	Name of the Student	Percentage of Marks	Rank
1	XXXXXX	XXXXXX	XXXXX	XXXX
2	XXXXXX	XXXXXXX	XXXX	XXXX
3	XXXXXX	XXXXXX	XXXX	XXXXX

6. Using Latex, generate the following formula:

$$a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{a_4}}}} + \begin{pmatrix} a & b \\ c & d \end{pmatrix} + \sum_{\alpha=0}^{\infty} (\beta^{\alpha} + \Gamma^{\alpha})$$

7. Using Latex, type the following Case Statements.

(a) $x_{\lambda} = \begin{cases} x & \text{if } \lambda \text{ is an eigen value}; \\ -x & \text{if } -\lambda \text{ is an eigen value}; \\ 0 & \text{otherwise}. \end{cases}$

(b) $|x| = \begin{cases} x & \text{if } x \geq 0; \\ -x & \text{if } x < 0; \\ 0 & \text{otherwise}. \end{cases}$

8. Using Latex, type the following Matrices

(a) $\begin{pmatrix} a_{11} & \Lambda & a_{1n} \\ M & O & M \\ a_{m1} & \Lambda & a_{mn} \end{pmatrix}$

(b) $B = \begin{array}{c} s_1 \\ s_2 \\ s_3 \\ s_4 \\ s_5 \end{array} \begin{pmatrix} (0.6,0.2) & (0.6,0.2) & (0.3,0.4) \\ (0.3,0.5) & (0.2,0.6) & (0.7,0.2) \\ (0.1,0.8) & (0.2,0.7) & (0.7,0.2) \\ (0.4,0.5) & (0.7,0.2) & (0.3,0.4) \\ (0.1,0.7) & (0.1,0.8) & (0.2,0.7) \end{pmatrix}$

with column headers $d_1 \quad d_2 \quad d_3$

9. Using Latex, type the following complicated mathematical structures.

(a) $\int_0^\infty e^{-\rho} \rho^{2l} \left[L_{n+l}^{2l+1}(\rho) \right]^2 \rho^2 d\rho = \frac{2n\left[(n+l)! \right]^3}{(n-l-1)!}$

(b) $\sqrt{\sqrt{n! + \sqrt{45}}} + \int_0^x \int_{\sqrt{\sqrt{16}}}^x \sqrt{\sqrt{e^x}} dx + \frac{d^2 y}{dx^2}$

10. Create a frame environment with title Latex Beamer presentation and include author name, institute, current date and footnote.

11. Include few figures in documents.

12. Create reference using bibliography environment and cite the references in a document.

WEB REFERENCES:

1. https://www.overleaf.com/
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi76srznJfzAhUMb30KHbe-DmEQFnoECFIQAQ&url=https%3A%2F%2Fen.wikibooks.org%2Fwiki%2FLaTeX&usg=AOvVaw2ArcMcGRJVL_9QatNg6A1h
3. http://www.docs.is.ed.ac.uk/skills/documents/3722/3722-2014.pdf

SYLLABUS FOR VALUE ADDED COURSES

S.NO.	CLASS	COURSE CODE	NAME OF THE COURSE
1	I – B.SC MATHEMATICS	25VAU1	FUNDAMENTAL MATHEMATICS AND COMMUNICATION SKILLS
2	II – B.SC MATHEMATICS	25VAU2	NUMBER ANALOGIES AND COMPREHENSIVE EVALUATION
3	III – B.SC MATHEMATICS	25VAU3	SPATIAL ABILITY

Category	Course Code	Title Of The Course	Contact Hours	Class
VALUE ADDED COURSE	25VAU1	FUNDAMENTAL MATHEMATICS AND COMMUNICATION SKILLS	75	I B. Sc MATHEMATICS

COURSE CONTENT

UNIT – I: **Numbers** **(12 Hours)**

Number system- HCF- LCM- HCF & LCM of Fraction Numbers - HCF & LCM of Decimal Numbers - Least 4 & 5 digit - Greatest 4 & 5 digit- Least & Greatest numbers - Unit digit - Divisibility Rule - Word Problems 1- Word Problems 2

UNIT – II: **Ratios and Proportions** **(12 Hours)**

Introduction- Finding Ratio's 1- Finding Ratio's 2- Based on numbers- Dividing into Parts 1- Dividing into Parts 2- Problems on Boys & Girls 1- Problems on Boys & Girls 2- Income and Expenditure- Coins- Problems on Ages

UNIT – III: **Basic Grammar 1** **(12 Hours)**

Parts of Speech - Tenses - Verbs - Sentence Formation

UNIT – IV: **Basic Grammar 2** **(12 Hours)**

Articles - Prepositions - Communication (based on General Topics)

UNIT – V: **Identifying Yourself** **(12 Hours)**

Introduction - Self Introduction (Writing Practice) - Self Introduction (Communication Practice)

RULES AND REGULATION:

The value-added course follows a non-semester pattern, with assessment conducted at the end of the year by the Training and Placement cell, totaling 100 marks. A minimum attendance of 70% is required to be eligible for the examination. The evaluation criteria for the course are as follows:

Split up for 100 Marks

Aptitude	25
Self Introduction	25
Grammar	25
Speaking skill	25

Category	Course Code	Title Of The Course	Contact Hours	Class
VALUE ADDED COURSE	25VAU2	NUMBER ANALOGIES AND COMPREHENSIVE EVALUATION	75	II B. Sc MATHEMATICS

COURSE CONTENT

UNIT – I: **Time & Work and Blood Relations**   **(15 Hours)**

Problems based on Single person - Pipes & Cisterns - Chain Rule- Division of Wages- Efficiency Problems- Problems based on Different Group of People- Word Problems - Blood Relation Introduction - Blood Relation Type 1 Problems- Blood Relation Type 2 Problems- Blood Relation Type 3 Problems

UNIT – II: **Averages and Percentages**   **(15 Hours)**

Average Basics- Basic Word Problems- Questions based on Equations- True/False Average Questions- Replacing a Person- Including & Excluding Problems- Average Speed Word Problems- Percentage Introduction- Percentage Difference- Percentage Word Problems

UNIT – III: **Writing and Interpersonal Skills 1**   **(15 Hours)**

Resume Writing- Voices and Speech- Body Language and Professionalism- Sentence Correction- Team Building- Debate

UNIT – IV: **Writing and Interpersonal Skills 2**   **(15 Hours)**

Letter Writing- Synonyms- Antonyms- Time Management- Idioms and Phrases- Analogy- Presentation Skills 1(Board Presentation)

UNIT – V: **Deliberation Skills**   **(15 Hours)**

HR Interview Questions- Group Discussion Introduction- Group Discussion Practice

RULES AND REGULATION:

The value-added course follows a non-semester pattern, with assessment conducted at the end of the year by the Training and Placement cell, totaling 100 marks. A minimum attendance of 70% is required to be eligible for the examination. The evaluation criteria for the course are as follows:

Split up for 100 Marks

Aptitude	25
Resume Writing	25
Verbal & Presentation Skill 1	25
Self Introduction & Group Discussion	25

Category	Course Code	Title Of The Course	Contact Hours	Class
VALUE ADDED COURSE	**25VAU3**	**SPATIAL ABILITY**	**75**	**III B. Sc MATHEMATICS**

COURSE CONTENT

UNIT – I: Time, Speed & Distance and Direction Sense   (15 Hours)

Basics & Introduction- Formulas & Unit Conversion- Problems Based on Trains (Single Object questions)- Problems Based on Trains (Double Object questions)- Direction Sense Type 1 & 2- Direction Sense Type 3 & 4- Direction Sense Type 5 & 6- Direction Sense Type 7 & 8

UNIT – II: Permutation, Combination & Probability   (15 Hours)

Permutation Introduction- Vowels always comes together questions- Vowels never comes together questions- Consonant always comes together questions- Consonant never comes together questions- No two vowels comes together questions- Some Letter comes together questions- 3/4/5 digit number questions- Problems Based on Numbers- Combination Basic Questions- Combination Types & Problems- Probability- Coins, Dice, Cards

UNIT – III: Interview Skills 1   (15 Hours)

Email Writing- Stress Interview Questions- Reading Comprehension- Communication (based on Current Affairs & Technology)

UNIT – IV: Interview Skills 2   (15 Hours)

Report Writing- Role Play- Presentation Skills 2(PPT presentation)

UNIT – V: Interview Practice   (15 Hours)

Group Discussion Mock - Personal Interview Mock

RULES AND REGULATION:

The value-added course follows a non-semester pattern, with assessment conducted at the end of the year by the Training and Placement cell, totaling 100 marks. A minimum attendance of 70% is required to be eligible for the examination. The evaluation criteria for the course are as follows:

Split up for 100 Marks

Aptitude	25
Writing & Presentation Skill 2	25
Self Introduction & Group Discussion	25
Personal Interview	25

SYLLABUS FOR CERTIFICATE COURSE OFFERED BY DEPARTMENT OF MATHEMATICS

NO.	CLASS	COURSE CODE	NAME OF THE COURSE
1.	II B. SC MATHEMATICS	25MACCU1	C PROGRAMMING

Category	Course Code	Title Of The Course	Contact Hours	Class
CERTIFICATE COURSE	**25MACCU1**	**C PROGRAMMING**	12	**II B. SC MATHEMATICS**

PREAMBLE:

To learn about the C programming language concepts.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO Statement	Knowledge Level
CO1	Learning the basics of C Tokens, Input and Output functions and Operators	K1
CO2	Define arrays and know the decision making statements.	K2
CO3	Use arithmetic operators, logical operators, relational operators, increment and decrement operators and conditional operators while writing a C program.	K3
CO4	Summarize the concepts of Decision Making and Looping functions	K4
CO5	Determine the usage for user defined functions, return values and their types, calling function, and category of functions.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate.

COs-POs MAPPING (COURSE ARTICULATION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	1
CO2	9	9	9	9	9	3	1
CO3	9	9	9	9	9	1	1
CO4	9	9	9	9	9	1	3
CO5	9	9	9	9	9	0	3
Total Contribution of COs to POs	45	45	45	45	39	14	9
Weighted Percentage of COs Contribution to POs	2.58	2.83	3.04	3.29	4.58	1.84	1.32

Level of correlation: 0 – No correlation; 1 – Low correlation; 3 – Medium correlation;
9- High correlation between COs and Pos .As per UGC Notification

COURSE CONTENT

UNIT I:

Basic structure of C Program – Character set, constants - Keywords and identifiers – variables – data type – declaration of variables- assigning values to variables – Defining symbolic constants.

UNIT II:

Arithmetic operators – relational operators - logical operators – assignment operators- increment and decrement operators - conditional operators – special operators – arithmetic expressions – type conversions in expressions.

UNIT III:

Reading a character – writing a character – formatted input and output – decision making with IF statement – Simple IF statement – IF ELSE statements - Nesting of IF ELSE statement – Switch statement – The GOTO statement – the WHILE statement – The DO statement – The FOR statement – Jumps in loops.

UNIT IV:

One dimensional array – Two dimensional arrays – initializing two dimensional arrays – multi dimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings to screen – Arithmetic operations on characters.

UNIT V:

Need for user defined functions – A multi function program – The form of C functions – Return values and their types – calling a function – Category of functions – no arguments and no return values.

TEXT BOOK:
1. E. Balagurusamy, Programming in ANSI C Tata McGraw – Hill publishing company Limited, New Delhi

UNIT	CHAPTER	SECTION
I	2	2.1-2.11
II	3	3.2-3.14
III	4,5,6	4.2-4.5, 5.2-5.7, 6.2-6.5
IV	7,8	7.2-7.7, 8.2-8.5
V	9	9.2-9.10

SYLLABUS FOR OPEN ELECTIVE OFFERED BY DEPARTMENT OF MATHEMATICS

S.NO	CLASS	COURSE CODE	NAME OF THE COURSE
1	OTHER DEPARTMENT UG	25MAUOE1	MATHEMATICS FOR BUSINESS

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
Part- III	CORE –XVIII OPEN ELECTIVE	25MAUOE1	MATHEMATICS FOR BUSINESS	48	2

PREAMBLE:

To enable the students to learn Business Mathematics.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of sequence and series, matrix, set theory, simple interest and compound interest.	K_1
CO2	interpret sequence and series, matrix, set theory, simple interest and compound interest.	K_2
CO3	apply different quantitative models in solving business problems	K_3
CO4	determine the solutions of the problems based on matrix , simple interest and compound interest problems	K_4
CO5	evaluate the problems on sequence and series, matrix, set theory, simple interest and compound interest problems.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	3	3	3	1
CO3	9	9	3	3	3	1	1
CO4	9	3	3	1	1	0	0
CO5	3	3	3	1	0	0	0
Total Contribution of COs to POs	39	33	27	17	10	7	5
Weighted Percentage of COs contribution to POs	2.24	2.08	1.83	1.25	1.14	0.91	0.73

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT – I: **SERIES**   **(10 Hours)**

Sequence and series - Arithmetic progression –Geometric progression – Arithmetic mean - Geometric mean – Harmonic mean.

UNIT – II: **MATRICES**   **(10 Hours)**

Fundamental ideas about Matrices and their operational rules- Matrix Multiplication- Inverse of a matrix.

UNIT – III: **SET THEORY**   **(10 Hours)**

Introduction- Types of sets- Set operation- Venn diagrams, Inconsistency of data.

UNIT – IV: **MATHEMATICS OF FINANCE**   **(9 Hours)**

Simple Interest.

UNIT – V: **MATHEMATICS OF FINANCE**   **(9 Hours)**

Compound Interest.

NOTE: No derivation and proof, simple problems only.

TEXT BOOK

Navnitham P.A (2012) – "Business Mathematics and Statistics", Sultan Chand & Sons, New Delhi.

UNIT	CHAPTER	PAGE
I	1	1 -33.
II	4	147-184.
III	3	104-136.
IV	2	43-51.
V	2	51-61.

REFERENCE BOOK:

 Vittal.P.R (2002) - "Business Mathematics and Statistics, Margham publishers, Chennai.

WEB REFERENCES:

1. http://www.mim.ac.mw/books/Business%20mathematics%20and%20statistics,%206th%20ed.pdf
2. https://en.wikipedia.org/wiki/Business_mathematics
3. https://youtu.be/pn2Fx9-G1Ds

SYLLABUS FOR ADVANCED LEARNERS

DEPARTMENT OF MATHEMATICS

S.NO	COURSE CODE	NAME OF THE COURSE
1	25MAALU1	NUMERICAL TECHNIQUES
2	25MAALU2	MATRIX THEORY
3	25MAALU3	GROUP THEORY
4	25MAALU4	VEDIC MATHEMATICS

Category	Course Code	Title Of The Course	Credits
EXTRA CREDIT	25MAALU1	NUMERICAL TECHNIQUES	4

PREAMBLE:

To enable the students to learn and gain knowledge about simultaneous linear algebraic equations, interpolation, numerical differentiation and integration.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of simultaneous linear algebraic equations, interpolation, numerical differentiation and integration.	K_1
CO2	explain the concepts of simultaneous linear algebraic equations, interpolation, numerical differentiation and integration.	K_2
CO3	apply different formulae to solve the problems on simultaneous linear algebraic equations, interpolation, numerical differentiation and integration.	K_3
CO4	analyze simultaneous equations and interpolation.	K_4
CO5	evaluate the problems based on Gauss Elimination Method, Gauss Jordan Method, interpolation, numerical differentiation and integration.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COURSE CONTENT

UNIT – I: **SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS**

Introduction – Gauss Elimination Method – Gauss Jordan Method – Inversion of a matrix using Gauss Elimination method

UNIT – II: **SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS (cont…)**

Method of Triangularisation method - Crout's method.

UNIT – III: **CENTRAL DIFFERENCE INTERPOLATION FORMULAE**

Central Difference table – Gauss's forward interpolation formula - Gauss's backward interpolation formula

UNIT – IV: **NUMERICAL DIFFERENTIATION**

Introduction – Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives – Problems

UNIT – V: **NUMERICAL INTEGRATION**

Numerical Integration – The Trapezoidal Rule – Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ Rules.

TEXT BOOK:

1. Dr.P.Kandasamy, Dr.K.Thilagavathi, Dr.K.Gunavathi (2005) - "Numerical Methods", S.Chand & Company LTD, New Delhi-110055.

UNIT	CHAPTER	PAGE NUMBER
I	IV	112-126
II	IV	126-141
III	VII	231-240
IV	IX	281-283, 286, 287
V	IX	299-305, 308-313

REFERENCE BOOKS:

1. Dr.Venkataraman.M.K. (2013) – "Numerical Methods in Science and Technology", The National Publishing Company, Chennai.

Category	Course Code	Title Of The Course	Credits
EXTRA CREDIT	**25MAALU2**	**MATRIX THEORY**	**4**

PREAMBLE:

To enable the students to gain the knowledge about matrix theory.

COURSE OUTCOME:

On the successful completion of the course students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the notions and definitions of matrices, determinants, adjoint matrix, ranks, eigen values and eigen vectors	K_1
CO2	explain the concepts of matrices, determinants, adjoint matrix, ranks, eigen values and eigen vectors	K_2
CO3	apply matrix theory to numerical problems	K_3
CO4	examine ranks, orthogonality, eigen values, eigen vector, Jordan canonical form, real quadratic form and the solution of system of simultaneous linear equations	K_4
CO5	evaluate inverse matrix, ranks, orthogonality, eigen values, eigen vectors , Jordan canonical form, real quadratic form and the solution of system of simultaneous linear equations	K_5

K_1 **- Remember;** K_2 **– Understand;** K_3 **- Apply;** K_4 **- Analyze;** K_5 **– Evaluate**.

COURSE CONTENT

UNIT – I: **Matrix Types and operations**

Types of Matrices- Matrix operations- Matrix equations

UNIT – II: **Determinants**

Minor, cofactor, Algebraic complement- Laplace's expansion – multiplication of determinants- Jacobi's theorems.

UNIT – III: **Solution to System of linear equations**

Adjoint or adjugate of a matrix – Cramer's rule- Inverse of a matrix

UNIT – IV: **Rank and Orthogonality**

Orthogonal and unilateral matrices- Rank of a matrix- Congruent matrix

UNIT – V: **Eigen values and Eigen vectors**

Cayley-Hamilton theorem- Minimal polynomial- Similarity of matrices – Diagonalization – Jordan canonical form – Real quadratic form

TEXT BOOK :

Dipak Chatterjee (2009) II edition-"Abstract Algebra",PHI Learning pvt. Ltd, New Delhi

Unit	Section	Page
I	8.1-8.3	245-256
II	8.4	257-268
III	8.5-8.7	268-276
IV	8.8-8.10	277-292
V	8.11	293-315

Category	Course Code	Title Of The Course	Credit
EXTRA CREDIT	25MAALU3	GROUP THEORY	4

PREAMBLE:

To enable the students to learn and gain knowledge about types of Groups and some functions on groups.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recollect the definitions and fundamental ideas of various Groups and some functions on groups.	K_1
CO2	Illustrate the basic concepts on types of Groups.	K_2
CO3	apply theoretical ideas of set theory and group theory for solving the simple problems.	K_4
CO4	analyze the various theorems and lemmas for groups.	K_3
CO5	evaluate the simple problems of Group theory.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate.**

COURSE CONTENT

UNIT – I: **GROUP**

Binary operations-Groups: Definitions and Examples – Basic properties.

UNIT – II: **SUB GROUPS**

Abelian group, Symmetric group, permutation groups, alternating groups, Quaternion group.

UNIT – III: **SOME SPECIAL GROUPS AND SUB GROUPS**

Klein's Group Subgroups – Group of isometries- Symmetric group -I_s Dihedral Group- Automorphism of group-Cyclic subgroup - Index of a group – Order of an element – Lagrange's theorem.

UNIT – IV: **SUB GROUPS AND HOMOMORPHISMS**

Normal Subgroups –centralizer –normalizer- commutator-Quotient Groups - Homomorphism theorem.

UNIT – V: **REPRESENTATION THEOREMS**

Cayley's theorem - Cauchy's theorem – Sylow's theorem.

TEXT BOOK:

Dipak Chaterjee (2009)—"Topics in Algebra", 2nd edition, PHI Learning PVT ltd, New Delhi.

UNIT	CHAPTER	SECTION
I	2	2.1 - 2.2
II	2	2.3.1 - 2.3.3
III	2	2.3.4 - 2.4.3
IV	2	2.4.4 - 2.5
V	2	2.6 - 2.8

REFERENCE BOOKS :

1. Fraleigh John .B (1986) - "An I course in Abstract Algebra", Narosa Publishing House, New Delhi Madras Bombay Calcutta.
2. Arumugam and Issac A.T (2003) - "Scitech Publishing (India) Pvt Ltd.
3. Vasishtha A.R (1994 – 95) - "Modern Algebra", Krishna Prakashan Mandir, Meerut.

Category	Course Code	Title Of The Course	Credit
EXTRA CREDIT	**25MAALU4**	**VEDIC MATHEMATICS**	**4**

PREAMBLE:

To enable the students to learn and gain knowledge about Vedic Mathematics

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of Vedic Mathematics	K_1
CO2	explain the concept of Vedic Mathematics in subtraction, multiplication, addition, division, square and cube .	K_2
CO3	apply the Sutras of Vedic Mathematics to compute subtraction, multiplication, addition, division, square, cubic and Linear Equations.	K_3
CO4	analyze the traditional method and Vedic method.	K_4
CO5	evaluate the problems on Vedic Mathematics in subtraction, multiplication, addition, division, square , cube and Linear Equations.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COURSE CONTENT

UNIT – I:

Introduction – Sutras of Vedic Mathematics – Advantages of using Vedic Mathematics – Applications of Vedic Mathematics in the Modern World- Simplification by Traditional Method versus Vedic method – Comparision between Traditional Method and Vedic method-. Sutra for finding Square of a number-Conversion of Vulgar Fraction into Decimal.

UNIT – II: **ADDITION AND MULTIPLICATION**

Addition-Multiplication-Subtraction of a number from an aadhar — Multiplication of two numbers close to an aadhar (base)Method– Cases : I , II and III- Division by 9-All from 9 and the last from 10 (Subtraction) – Cases : I , II and III.

UNIT – III: **MULTIPLICATION AND DIVISION**

Two – digit Multiplication without carry - Two – digit Multiplication with carry over – Three – digit Multiplication- Division-When the remainder is positive and negative- Multiplication by 12-Divisibility by 4-Multiplication-Division-"Antyayordasakepi" sutra.

UNIT – IV: **LINEAR EQUATION**

Linear Equation – "Shunyan Samyasamuchaye" sutra- Solving Simultaneous Linear Equations (Anurupye Shunyamanyat & Sankalana Vyavkalanabhyam).- Roots of a Quadratic Eqation-Roots of Cubic Equations-Roots of a Quadratic Equation.

UNIT – V: **SQUARE AND CUBE**

Square of a number –Cube of a number-Rational Expression-Square root-Cube root.

TEXT BOOK:

Sumita Bose -2017 "Vedic Mathematics"– V&S Publishers, New Delhi.

Unit - I	Page: 19-28
Unit – II	Page: 62-65,29-36
Unit –III	Page: 37-45,68-71,79-86,102-104
Unit –IV	Page: 46-61
Unit – V	Page: 98-101, 105-107, 118-125

REFERENCE BOOK:

1. H.K. Gupta -2014 "Vedic Mathematics"– BPI Publishers, New Delhi.

SYLLABUS FOR ALLIED COURSES

SYLLABUS FOR ALLIED COURSES

SEMESTER - I

I B.B.A

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credit
PART-III	CORE ALLIED	25BAU03	BUSINESS MATHEMATICS	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To enable the students to gain the knowledge about the series, set theory, matrix, simple and compound interest, linear programming problem.

COURSE OUTCOME:

On the successful completion of the course students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the notions and concepts of set theory, matrices, simple and compound interest and LPP	K_1
CO2	classify sets, simple interest, compound interest, LPP and matrices	K_2
CO3	apply the formulae to solve the different business problems based on interests, matrix, sets and LPP	K_3
CO4	Examine sets and set operations, interests, matrix and matrix operations and LPP	K_4
CO5	evaluate LPP using graphical method, set operations, matrix operations and the solution of system of simultaneous linear equations	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	1	1	1
CO3	9	9	3	3	1	1	1
CO4	9	9	3	3	1	1	0
CO5	9	9	3	3	1	1	0
Total Contribution of COs to POs	45	45	27	27	7	7	5
Weighted Percentage of COs contribution to POs	**2.64**	**3.16**	**2.34**	**2.77**	**0.87**	**1.23**	**0.81**

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT- I: SET THEORY (**15 Hours**)
  Introduction- Types of sets- Set operation- Venn diagrams.
UNIT – II: MATHEMATICS OF FINANCE (**15 Hours**)
  Basic concepts - Simple Interest: Simple Interest – Formulae and problems.
UNIT – III: MATHEMATICS OF FINANCE (CONTINUE…) (**15 Hours**)
  Basic concepts - Compound Interest: Compound Interest – Formulae and problems.
UNIT – IV: MATRICES, DETERMINANTS (**15 Hours**)
  Definition of a matrix- Order of a matrix – Types of a matrix– Matrix operations: A System
of Linear Equations – Determinants- Cramer's Rule.
UNIT – V: LINEAR PROGRAMMING PROBLEM (**12 Hours**)
  Introduction-meaning and scope -Limitations -Linear Programming Problem – Formulation
of LPP – Solution by Graphical Method Solution.

NOTE: Distribution Of Marks: Theory 20%, Problem 80%.
TEXT BOOK

Navnitham. P.A.(2012) - "Business mathematics and statistics", Jai publishers, Trichy.

UNIT	CHAPTER	PAGE NUMBER
Unit - I	Chapter 3	Page: 104-126
Unit - II	Chapter 2	Page: 43-50
Unit -III	Chapter 2	Page: 51-60
Unit -IV	Chapter 4	Page: 147-175
Unit -V	Chapter 9	Page: 328-345

REFERENCE BOOKS:

1. Sundaresan and Jayaseelan, (2013)- " Introduction to Business Mathematics", Sultan chand Co& Ltd, Newdelhi.
2. Sanchetti, D.C and Kapoor, V.K.(2011)- " Business Mathematics" , Sultan chand Co& Ltd, Newdelhi.
3. G.K.Ranganath, C.S.Sampamgiram and Y.Rajan (1998)-"A Text book Business Mathematics-Himalaya Publishing House.

WEB REFERENCES:

1. https://www.scribd.com/doc/234328874/Business-Mathematics-and-Statistics-pdf

2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjgnuGA9JbzAhVNgUsFHQ88BngQFnoECAYQAQ&url=https%3A%2F%2Fwww.slideshare.net%2FEShubina%2Fset-theory&usg=AOvVaw00ArORMHIhl7hXEse-TTPj

3. https://youtu.be/pn2Fx9-G1Ds

4. https://www.youtube.com/watch?v=xFAwNmq5nX8

B. SC (CS) / B. SC (IT) / BCA/ B.SC (CYBER SECURITY)   DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART-III	CORE ALLIED	25CSU04/ 25ITU04/ 25CAU04/ 25CYU04	**MATHEMATICAL STRUCTURE FOR COMPUTER SCIENCE**	**60**	**3**

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	**I**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn about Matrices, Simultaneous Linear equations, Numerical Differentiation and Integration and also Measures of Central tendency.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic definitions of Matrices, upper and lower triangular matrix, Numerical Differentiation and Integration, Measures of central tendency and Simultaneous algebraic equations.	K_1
CO2	explain the basic concepts of Matrices, Gauss Elimination, Gauss Jordon, Gauss Jacobi Methods, Gauss Seidel Methods and also Newton's forward & backward Difference Formula, Newton's cotes formula and also Measures of central tendency.	K_2
CO3	apply various formulae to solve the problems on Matrices, Numerical Differentiation and Integration, Measures of central tendency and algebraic equations.	K_3
CO4	analyze the relationship between mean, median, mode and Trapezoidal Rule & Simpson's rule	K_4
CO5	evaluate the problems under Matrices, Simultaneous Linear equations, Numerical Differentiation and Integration and also Measures of central tendency.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	3	3	3	3	0	0	0
Total Contribution of COs to POs	39	39	33	33	10	10	10
Weighted Percentage of COs contribution to POs							
B.SC COMPUTER SCIENCE	2.18	2.33	2.04	2.12	1.09	0.83	0.71
B.SC IT	2.17	2.29	1.95	2.12	1.07	0.73	0.71
B.C.A	1.77	1.85	1.63	1.82	0.58	0.61	0.86
B.SC CYBER SECURITY	2.18	2.33	2.04	2.12	1.09	0.83	0.71

**Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs**

COURSE CONTENT

UNIT – I :   **MATRIX**   **(15 Hours)**

        Matrices – Introduction –Addition, Subtraction and Multiplication of Matrix –

Determination – Inverse of a matrix – Rank of a Matrix.

UNIT - II :   SIMULTANEOUS LINEAR ALGEBRAIC EQUATION   (10 Hours)

        System of Simultaneous Linear algebraic Equation. Gauss Elimination, Gauss Jordon,

Gauss Jacobi Methods, Gauss Seidel Methods.

UNIT – III :   **NUMERICAL DIFFERENTIATION**   **(10 Hours)**

        Newton's forward Difference Formula - Backward Difference Formula – Stirling's

formula.

UNIT – IV :   **NUMERICAL INTEGRATION**   **(10 Hours)**

        Introduction- Newton's cotes formula - Trapezoidal Rule - Simpson's 1/3 rule –

        Simpson's 3/8 rule.

UNIT – V :   **MEASURES OF CENTRAL TENDENCY**   (**15 Hours**)

        Mean, Median and Mode – Relationship among mean median and mode.

Note: Distribution of Marks: Theory 20% Problem 80%

TEXT BOOKS:

1. P.A.Navanitham (Revised Edition -2012) "Business Mathematics and Statistics", Jai Publishers, Trichy-21, April 2012. **(Unit I & V)**
2. P.Kandasamy, K.Thilagavathy, K.Gunavathi. (Revised Edition -2005) "Numerical Methods" S.Chand & Company Ltd, Ram Nagar, New Delhi-110 055. **(Unit II & III & IV)**

UNIT	BOOK	CHAPTER	PAGE NO.
I	1	Part I	147-188.
II	2	4	112-121, 145-159.
III	2	9	280-290.
IV	2	9	299-317.
V	1	Part II	159-181,196-227.

REFERENCE BOOKS:

1. E. Balagurusamy – (2007) "Numerical Methods", 22nd Edition ,Tata McGraw Hill, New Delhi.
2. S. C. Gupta, V. K. Kapoor – (2007), "Fundamental of Mathematical Statistics", 12th Edition, Sultan Chand & Sons, New Delhi.

WEB RESOURCES:

1. https://youtu.be/J8dSwvPfEc4
2. https://www.slideshare.net/TausifShahanshah/presentation-on-numerical-integration
3. https://www.slideshare.net/CasperWendy/measures-of-central-tendency-mean-median-mode

B.SC (AI & ML) DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE ALLIED	25AMU04	DISCRETE MATHEMATICS	60	3

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To enable the students to learn about Mathematical Logics, Relations and Functions, Combinatorics, Recurrence Relations and Lattices.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of logical operations, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K_1
CO2	illustrate the properties of logical operations, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K_2
CO3	apply the various formulae to solve the rules of tautology, rules of inference, properties of functions, Combinatorics, Recurrence Relations and Lattices.	K_3
CO4	examine about logical operators, relations and functions, Combinatorics, Recurrence Relations and Lattices.	K_4
CO5	evaluate the problems based on logical expressions, relations, functions, Combinatorics, Recurrence Relations and Lattices..	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	3	3	1	1	1
CO5	3	3	3	3	0	0	0
Total Contribution of COs to POs	39	39	33	33	10	10	10
Weighted Percentage of COs contribution to POs	2.16	2.86	2.04	2.19	0.85	0.94	0.95

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT – I :   **MATHEMATICAL LOGIC**   **(15 Hours)**

Propositional Calculus – Basic Logical Operations – statements generated by set – conditional statements – bi conditional statements – tautologies – contradiction – arguments – methods of proof – Equivalence and implication –Predicate Calculus – Quantifiers.

UNIT – II :   **RELATIONS AND FUNCTIONS:**   **(10 Hours)**

Binary relations – types of relations - Partial Order relations - Equivalence Relations - Composition of Relations.

Definition and notation of a function – types of functions – invertible functions – Composition of functions - identity function.

UNIT – III :   **COMBINATORICS**   **(10 Hours)**

Permutations – Combinations - Pigeonhole principle.

UNIT – IV :   **RECURRENCE RELATIONS**   **(15 Hours)**

Introduction - Recurrence Relation –linear recurrence relations with constant coefficients – methods of solving with constant coefficients - non-homogeneous recurrence relations.

UNIT – V :   **LATTICES**   **(10 Hours)**

Totally ordered set or chain - Product set and partial order relation – Hasse diagrams - Lattice– Properties of Lattices – duality – types of lattices.

TEXT BOOK:

Sharma.J.K. (Fifth Edition) – "Discrete Mathematics", University Science Press (An imprint of

Laxmi Publications Pvt. Ltd.)

UNIT	CHAPTER	PAGE NO.
I	12	394 – 427
II	3 4	84 – 92, 101,102 109 – 121
III	6	155 – 166, 170-177, 179
IV	8	218 – 243
V	14	487 – 504

B. SC (PHYSICS) DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE ALLIED	25PHU03	MATHEMATICS-I	60	5

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To enable the students to learn about matrices and determinants, different types of equations, Laplace transforms and Fourier series.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the definitions of matrices, polynomial equations, Laplace, inverse Laplace transforms and Fourier series.	K_1
CO2	explain the operations of matrix, roots of the equations, standard functions of Laplace, inverse Laplace transforms and Fourier series.	K_2
CO3	apply the concepts of matrices, theory of equations, Fourier series of functions, Laplace and inverse Laplace transforms to solve the problems.	K_3
CO4	analyze Cramer's Rule, Irrational roots, complex roots, hyperbolic functions and Transform of $tf(t), f(t)/t$.	K_4
CO5	evaluate the problems in Laplace transforms, inverse Laplace transforms, Matrices, Reciprocal Equations and Fourier series.	K_5

K_1 **- Remember;** K_2 **– Understand;** K_3 **- Apply;** K_4 **- Analyze;** K_5 **– Evaluate.**

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	1	1	1
CO5	9	9	3	3	0	0	0
Total Contribution of COs to POs	45	45	39	39	10	10	10
Weighted Percentage of COs contribution to POs	2.27	2.54	2.46	2.90	0.93	1.12	1.21

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation; 9- High Correlation between COs and POs

COURSE CONTENT

UNIT - I   **MATRICES, DETERMINANTS**   (**10 Hours**)

Definition of a matrix- Order of a matrix – Types of a matrix– Matrix operations I:A System of Linear Equations – Determinants- Cramer's Rule – Matrix Operation II: Inverse of a matrix – Rank of matrix .

UNIT - II   **THEORY OF EQUATIONS**   (**15 Hours**)

Polynomial Equations with real coefficients - Irrational roots, complex roots - Reciprocal Equations - Newton's method to find a root approximately**.**

UNIT - III   **LAPLACE TRANSFORMS**   (**15 Hours**)

Definition – Laplace Transform of Standard functions – Linearity property – I shifting theorem – Transform of $tf(t), f(t)/t$.

UNIT-IV   **INVERSE LAPLACE TRANSFORMS**   (**10 Hours**)

Inverse Laplace transforms of standard functions – I shift theorem - Laplace Transform of derivatives and integrals.

UNIT - V   **FOURIER SERIES**   (**10 Hours**)

Fourier series of functions in (0, 2π) and (-π, π).

NOTE: Distribution of Marks: Problem 100%.

TEXT BOOKS

1. Navnitham. P.A.(2012) - "Business mathematics and statistics", Jai publishers, TRICHY.

2. Kandasamy. P, Thilagavathi. K(2012) - "ALLIED MATHEMATICS", Paper-I, S.Chand and Company Ltd, New Delhi.

3. Kandasamy. P, Thilagavathi. K "MATHEMATICS for B.Sc– Volume III(2004) and Volume IV(2005)", S. Chand and Company Ltd,New Delhi.

UNIT	BOOK	CHAPTER	VOLUME	PAGE NO
I	1	4	I	147-188
II	2	1,2,3	I	39-47,56-71
III	3	1	III	187-201
IV	3	1	III	202-225
V	3	1	IV	93-134

REFERENCE BOOKS

1. Manickavasagam Pillai.T.K.and Narayanan.S(2012) – "Trigonometry" - Viswanathan Publishers and Printers Pvt. Ltd.

2. Manickavasagam Pillai.T.K.and Narayanan.S.,Hanumantha Rao.R(2011) - "Ancillary Mathematics", Volume-II Viswanathan Publishers and Printers Pvt. Ltd.

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Inverse_Laplace_transform

2. https://youtu.be/5nNPf_EB7Es

3. https://nptel.ac.in/courses/111/107/111107112/

B. COM P.A. DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
Part – III	Core : III Allied: I	25CPU03	Business Mathematics	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	I	25	75	100

PREAMBLE:

To develop an understanding of the basic mathematical tools and apply the same in business, finance and economic situations.

COURSE OUTCOME:

After completion of the course, the learners will be able to

COs	CO Statement	Knowledge Level
CO 1	recall the basic concepts of ratio and proportions, equations, and sequence and series.	K1
CO 2	explain indices and logarithms, linear inequalities, and permutations and combinations.	K2
CO 3	apply different quantitative models in solving business problems.	K3
CO 4	determine the solutions of the problems based on Sets, Relations, and Functions, and Differential and Integral Calculus.	K4
CO 5	evaluate the problems on sequence and series, and permutations and combinations.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICUALTION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	1	1	1
CO4	9	9	9	9	1	1	1
CO5	9	9	9	3	0	0	0
Total Contribution of COs to POs	45	45	45	39	8	8	8
Weighted Percentage of COs Contribution to POs	2.59	3.03	3.02	3.67	1.3	1.19	1.3

Level of Correlation: 0-No Correlation; 1-Low Correlation; 3-Medium Correlation; 9-High Correlation between COs and POs

COURSE CONTENT:

UNIT-I **(12 Hours)**
Ratio and proportion, Indices and Logarithms:
Ratio and proportion and Time and work-related problems, Laws of Indices, Exponents and Logarithms and Anti Logarithms.

UNIT-II **(12 Hours)**
Equations and Linear Inequalities:
Equations: Linear Simultaneous linear equations up to three variables, Quadratic and Cubic equations in one variable. Applications in Business related problems. Linear Inequalities: Linear Inequalities in one and two variables and the solution space.

UNIT-III **(12 Hours)**
Permutations and Combinations:
Basic concepts of Permutations and combinations: Introduction - the factorial – permutations - results – circular – permutations - permutations with restrictions - Combinations with standard results.

UNIT-IV **(12 Hours)**
Sequence and Series:
Introduction Sequences – Series - Arithmetic and Geometric progression - Relationship between AM and GM and Sum of n terms of special series and Business Applications.

UNIT-V **(12 Hours)**
Sets, Relations, and Functions and Differential and Integral Calculus:
Sets - Relations and Functions - Basics of Limits and Continuity functions - Basic applications of Differential and Integral calculus in Business and Economics (Excluding the trigonometric applications).
Note: Problem: 80%; Theory: 20%
TEXT BOOK:

S.No	Authors	Title	Publishers	Year of Publication
1	Navanitham, P,A.	Business Mathematics and Statistics	Jai publishers, Trichy.	2012

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1	CA. Vandana D Nagpal	Foundation Course Study Material – Quantitative Aptitude	Institute of Chartered Accountants of India, New Delhi	2024
2	Ranganath, G,S, Sampamgiram,C.S and Rajan,Y	A Text book of Business Mathematics	Himalaya Publishing House	2015
3	Sundaresan and Jayaseelan	Introduction to Business Mathematics	Sultan Chand Co & Ltd, New Delhi	2013
4	Sanchetti D.C and Kapoor V.K	Business Mathematics	Sultan Chand Co & Ltd, New Delhi	2015

WEB REFERENCE:
https://www.icai.org/post.html?post_id=19139

SEMESTER - II

B.B.A DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART-III	CORE ALLIED	25BAU06	BUSINESS STATISTICS	72	4

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE:

To enable the students to gain the knowledge about diagrams and graphs, measures of central tendency, time series, correlation and regression.

COURSE OUTCOME:

On the successful completion of the course students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the formulae of mean, median, mode, correlation, regression and secular trend methods	K_1
CO2	identify one and two dimensional diagrams, properties of correlation and regression, graphs of time series and types of averages	K_2
CO3	draw trend line, regression line, graphs, one dimensional and two dimensional diagrams.	K_3
CO4	analyze the time series, co-efficient of correlation and regression equations and relationship among mean, median, mode.	K_4
CO5	evaluate the problems on correlation and regression, measures of central tendency, time series and graphs of time series	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	1	1	1
CO3	9	9	3	3	1	1	1
CO4	9	9	3	3	1	1	0
CO5	9	9	3	3	1	1	0
Total Contribution of COs to POs	45	45	27	27	7	7	5
Weighted Percentage of COs contribution to POs	2.64	3.16	2.34	2.77	0.87	1.23	0.81

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT – I : **DIAGRAMS AND GRAPHS** (**15 Hours**)

Diagrams - Rules for Constructions- Types of Diagrams-Drawing Diagrams in one dimensional, two dimensional. Graphs- Graphs of time series & Historigrams – Graphs of frequency distribution (equal class- intervals only)

UNIT – II :   **MEASURES OF CENTRAL TENDENCY**   **(15 Hours)**

Meaning and definition-Types of averages -Arithmetic mean –Median – Mode

UNIT– III :   **CORRELATION**   **(15 Hours)**

Correlation Analysis – Meaning of correlation; Types of correlation -Scatter Diagram - Karl Pearson's coefficient of correlation - Spearman's rank correlation coefficient – Concurrent Deviation Method.

UNIT – IV :   **REGRESSION**   **(15 Hours)**

Simple linear regression- Meaning and uses - Differences between Correlation and regression - Two regression lines -Properties of Regression lines and Co-efficient.

UNIT –V :   **ANALYSIS OF TIME SERIES**   **(12 Hours)**

Analysis of Time Series: Definition – Uses - Methods of Secular Trend – Graphical Method – Method of Semi Averages – Method of Moving Averages – Method of Least squares.

NOTE: No derivation and proof, simple problems only.

TEXT BOOK

Navnitam. PA (2012) – "Business Mathematics and Statistics", Jai Publishers, Trichy.

UNIT	CHAPTER	PAGE
I	VI	98-118, 124-134
II	VII	159 – 227
III	XII	503-539
IV	XIII	540-553,563-571
V	XIV	579-600

REFERENCE BOOKS:

1. Gupta S.P (2014) – "Statistical Methods" , Sultan Chand & Sons, New Delhi.

2. Vittal. P.R (2002) - Business Mathematics and Statistics, Margham publishers, Chennai.

WEB REFERENCES:

1. https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/
2. http://www.pitt.edu/~super4/33011-34001/33851.ppt
3. https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc4.htm

B. SC (COMPUTER SCENCE) / B. SC (IT) / BCA / B.SC (CYBER SECURITY)

DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART-III	CORE ALLIED	25CSU08/ 25ITU08/ 25CAU08/ 25CYU08	DISCRETE MATHEMATICS	72	3

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE:

To enable the students to gain knowledge about the set theory, logical operations, relations, grammars and graphs

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic terms of set operations, logical operations, relations, grammars and graphs	K_1
CO2	explain the concepts of sets, relations, logical operations and graphs.	K_2
CO3	apply the various formulae to solve the problems based on set operations, logical operations, relations, grammars and graphs.	K_3
CO4	examine the relation between sets, logical operations and graphs.	K_4
CO5	evaluate the problems on set operations, logical operations, relations, grammars and graphs.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	3	1	1	1
CO5	3	3	3	3	0	0	0
Total Contribution of COs to POs	39	39	39	33	10	10	10
Weighted Percentage of COs contribution to POs							
B. SC (COMPUTER SCENCE)	2.51	2.68	2.78	2.70	4.92	3.75	3.21
B.SC IT	2.50	2.64	2.66	2.70	4.83	3.31	3.19
B.C.A	2.04	2.13	2.22	2.31	2.61	2.75	3.98
B.SC (CYBER SECURITY)	2.51	2.68	2.78	2.70	4.92	3.75	3.21

**Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs**

COURSE CONTENT

UNIT – I :   **SET THEORY**   **(15 Hours)**

Introduction-Set and its elements-Set description-Types of sets-Venn-Euler Diagrams- Set operations and laws of set theory.

UNIT - II :   **RELATIONS**   **(15 Hours)**

Binary relations – Cartesian product of sets - Set operations on relations-Types of relations – Partial order relations – Equivalence relation – Composition of relations.

UNIT - III :   **GRAPH THEORY**   **(15 Hours)**

Introduction – Basic terminology – Paths, cycles and connectivity – Sub graphs - Types of graphs – Isomorphic graphs-Homeomorphic graphs-Representation of graphs in computer memory.

UNIT – IV :   **MATHEMATICAL LOGIC**   **(15 Hours)**

Introduction- Prepositional calculus –Basic logical operations- Tautologies-Contradiction-Contingency-Argument-Method of proof- Equivalence and implication.

UNIT – V :   **LANGUAGE, GRAMMAR AND AUTOMATA**   **(12 Hours)**

Introduction-Languages – Operations on languages – Regular expressions and regular languages – Grammar – Types of grammars – Finite state machine.

TEXT BOOK

Sharma.J.K. (2010) – "Discrete Mathematics", Macmillan publishers India Ltd.

UNIT	CHAPTER	PAGE NUMBER
I	I	1-16
II	III	77-85,92-93
III	IX	221-247
IV	XII	333-341,352-364
V	XV	440-467

REFERENCE BOOKS:

1. Tremblay.J.P.,Manohar.R.(1997) – "Discrete Mathematical Structures with Applications to Computer Science", Mc Graw Hill Education (India) Pvt.Ltd.

2. Venkataraman.M.K., Sridharan.N, Chandarasekaran.N.(2001) – "Discrete Mathematics", National Publishing Company, Chennai.

WEB RESOURCES:

1. https://youtu.be/xlUFkMKSB3Y
2. https://youtu.be/oaOm2pnKkyY

B. SC (AL & ML) DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	CORE ALLIED	25AMU08	APPLIED MATHEMATICS	60	3

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE:

To enable the students to gain knowledge about set theory, graph theory, grammars, measures of central tendency and probability.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO's	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic terms of set operations, graphs, grammars, Measures of Central Tendency and probability.	K_1
CO2	explain the concepts of sets, graphs, grammars, Measures of Central Tendency and probability.	K_2
CO3	apply the various formulae to solve the problems based on set operations, graphs, grammars, Measures of Central Tendency and probability.	K_3
CO4	analyze the relationships between mean, median and mode, set operations, graphs, grammar and probability.	K_4
CO5	evaluate the problems on sets, graphs, grammars, Measures of Central Tendency and probability.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	3	1	1	1
CO5	3	3	3	3	0	0	0
Total Contribution of COs to POs	39	39	39	33	10	10	10
Weighted Percentage of COs contribution to POs	2.16	2.86	2.41	2.19	0.85	0.94	0.95

**Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs**

COURSE CONTENT

UNIT – I: SETS   **(12 Hours)**

Introduction – Sets and its element – Set description – Types of Sets – Venn-Euler diagram – Set operations and Laws of Set theory.

UNIT – II: GRAPH THEORY   (12 Hours)

Introduction – Basic terminology – Paths, Cycles and Connectivity – Sub graphs – Types of graphs – Isomorphic Graphs – Homeomorphic graphs – Representation of Graphs in Computer memory.

UNIT – III: LANGUAGE, GRAMMAR AND AUTOMATA   (12 Hours)

Introduction – Language: The set theory of Strings – Languages – Regular expressions and regular languages – Grammar – Finite state machine - Finite State Automata.

UNIT – IV: MEASURES OF CENTRAL TENDENCY   (12 Hours)

Mean, Median and Mode – Relationship among Mean Median and Mode.

UNIT – V: PROBABILITY   (12 Hours)

Random Experiment – Relative frequency approach – example problems

(Method – I, II, III and IV)

Text Book:

Book 1 - Sharma.J.K. (Fifth Edition) – "Discrete Mathematics", University Science Press (An imprint of Laxmi Publications Pvt. Ltd.) **(Unit I, II and III)**

Book 2 - P.A.Navanitham (Revised Edition -2012) "Business Mathematics and Statistics", Jai Publishers, Trichy-21, April 2012. **(Unit IV & V)**

UNIT	Book 1 and Book 2	CHAPTER	PAGE NO.
I	Book 1	1	2 - 18
II	Book 1	9	258 - 287
III	Book 1	15	518 – 526, 532-538,540 - 554
IV	Book 2	Part 2	159-181,196-226.
V	Book 2	Part 2	654 - 679

B. SC (PHYSICS) DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE ALLIED**	**25PHU06**	**MATHEMATICS - II**	**72**	**5**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	**II**	**25**	**75**	**100**

PREAMBLE:

To enable the students to learn and gain the knowledge and ideas about curvature, multiple integrals, Ordinary and Partial differential equations.

COURSE OUTCOME:

On the successful completion of the course students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the basic concepts of curvature, differentiation and integration .	K_1
CO2	express radius of curvature, double and triple integrals, beta and gamma functions, ordinary and partial differential equations.	K_2
CO3	apply the formula for Beta - Gamma functions, radius and centre of curvature for finding the results.	K_3
CO4	analyze the general of ordinary, partial differential equations, Beta - Gamma functions and change of order of integrations.	K_4
CO5	Evaluation of multiple integrals and differential equations.	K_5

K_1 - **Remember;** K_2 – **Understand;** K_3 - **Apply;** K_4 - **Analyze;** K_5 – **Evaluate**.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	9	9	9	9	3	3	3
Total Contribution of COs to POs	45	45	45	45	15	15	15
Weighted Percentage of COs contribution to POs	2.27	2.54	2.84	3.35	1.40	1.68	1.82

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT - I   **CURVATURE**   **(15 Hours)**

Curvature – Radius of curvature – Center of curvature – Circle of curvature

UNIT - II   INTEGRATION   (15 Hours)

Evaluation of double integrals - Change of order of integration in double integrals
-Evaluation of triple integrals.

UNIT – III   BETA AND GAMMA FUNCTIONS   (15 Hours)

Beta and Gamma functions – Relations between Beta and Gamma functions – Evaluation of
multiple integrals using Beta and Gamma functions.

UNIT – IV   ORDINARY DIFFERENTIAL EQUATIONS   (15 Hours)

Solving II order linear differential equations with constant coefficients whose R.H.S is of
the form ve^{mx}, where v is any function of x-to find the meanings for $f(D^2)\sin(ax + b)$ and $f(D^2)\cos(ax + b)$.

UNIT – V   PARTIAL DIFFERENTIAL EQUATIONS   (12 Hours)

Formation of partial differential equations by elimination of arbitrary constants and
functions -Definitions of general, particular and complete solutions - Solving standard forms
$f(p, q) = 0$.

Note: Distribution of Marks: Theory 20% Problem 80%

TEXT BOOK

1. Kandasamy. P, Thilagavathi.K.(2004) - "Mathematics for B.Sc. Branch I", 1st edition,Volume II and III, S.Chand and Company Ltd, New Delhi.
2. Narayanan.S. and Manicavachasam Pillai.T.K (2017) – " Calculus Volume II"- Viswanathan Publishers.

UNIT	BOOK	CHAPTER	VOLUME	PAGE NO
I	1	II	II	324-344
II	1	VI	II	432-444
III	2	VIII	II	278-295
IV	1	II	III	16-35
V	1	I	III	117-136

REFERENCE BOOK:

Narayan.S and Manicavachagam Pillay.T.K. (1993) - "Ancillary Mathematics",

Viswanathan Publishers and Printers Pvt. Ltd.

WEB REFERENCES:

1.https://en.wikipedia.org/wiki/Beta_function

2.https://users.aber.ac.uk/ruw/teach/260/classification.php

B. COM P.A. DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
Part – III	Core: IX Allied: II	25CPU07	BUSINESS STATISTICS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
I	II	25	75	100

PREAMBLE:
To enable the students to learn the statistical methods and their applications in Commerce.

COURSE OUTCOME:
After completion of the course, the learners will be able to

COs	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the meaning of measures of central tendency, correlation, regression and probability.	K1
CO2	explain the concept of diagrammatic representation of data, measures of central tendency, correlation, regression, and probability.	K2
CO3	apply various formulae to solve the problems on measures of central tendency, correlation, regression, and probability.	K3
CO4	analyze the relations between Mean Median, Mode, correlation and regression.	K4
CO5	evaluate the problems on measures of central tendency, correlation, regression, probability and theoretical distribution.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICUALTION MATRIX)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	3	3	1
CO5	9	9	9	9	3	3	0
Total Contribution of COs to POs	45	45	45	45	15	27	8
Weighted Percentage of COs Contribution to POs	2.59	3.03	3.02	4.23	2.43	4.02	1.3

Level of Correlation: 0-No Correlation; 1-Low Correlation; 3-Medium Correlation; 9-High Correlation between COs and POs

COURSE CONTENT:

UNIT-I **(12 Hours)**
Statistical Representation of Data:
Diagrammatic representation of data - Frequency distribution - Graphical representation of Frequency Distribution – Histogram - Frequency Polygon – Ogive - Pie-chart.

UNIT-II **(12 Hours)**
Sampling:
Basic principles of sampling theory - comparison between sample survey and complete enumeration - some important terms associated sampling types of sampling - sampling and non-sampling errors.

UNIT-III **(12 Hours)**
Measures of Central tendency and Dispersion:
Measures of Central Tendency and Dispersion: Mean – Median – Mode - Mean Deviation - Quartiles and Quartile Deviation - Standard Deviation - Co-efficient of Variation - Coefficient of Quartile Deviation.

UNIT-IV **(12 Hours)**
Probability and Theoretical Distributions:
Independent and dependent events - mutually exclusive events – Total and Compound Probability and Bayes' theorem. Theoretical Distributions: Random variables - Discrete and Continuous Random variables - Expectation of a discrete random variable - Theoretical Distributions: Binomial Distribution, Poisson distribution – basic application and Normal Distribution – basic applications.

UNIT-V **(12 Hours)**
Correlation, Regression and Index Numbers:
Scatter diagram - Karl Pearson's Coefficient of Correlation Rank Correlation - Regression lines - Regression equations – Regression coefficients. Index Numbers: Uses of Index Numbers - Problems involved in construction of Index Numbers - Methods of construction of Index Numbers - BSE SENSEX and NSE.
Theory – 20% ; Problems – 80%

TEXT BOOK:

S.No	Authors	Title	Publishers	Year of Publication
1	Navanitham, P.A.	Business Mathematics and Statistics	Jai publishers, Trichy.	2012

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1	CA. Vandana D Nagpal	Foundation Course Study Material – Quantitative Aptitude	Institute of Chartered Accountants of India, New Delhi	2024
2	Gupta. S.P.	Statistical Methods	Sultan Chand & Sons, New Delhi	2016

WEB REFERENCE:
https://www.icai.org/post.html?post_id=19139
SEMESTER - III

B. SC (COMPUTER SCIENCE) / BCA DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours/ Semester	Credits
PART III	**CORE ALLIED**	**25CSU12/ 25CAU11**	**OPERATIONS RESEARCH**	**72**	**3**

Contact hours per week: 6

Year	Semester	Internal Marks	External Marks	Total Marks
I	**III**	**25**	**75**	**100**

PREAMBLE:

To enable the students to understand how to formulate a real-world problem into a LPP.

COURSE OUTCOME:

On the successful completion of the course, students will be able to

CO'S	CO STATEMENT	KNOWLEDGE LEVEL
CO1	recall the mathematical tools that are needed to solve Operations Research problems.	K_1
CO2	discuss the properties of Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K_2
CO3	identify the solution of LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K_3
CO4	analyze the salient features of operations research in different problem solving methods.	K_4
CO5	evaluate the problems on LPP, Transportation, Assignment, Game Theory, Replacement models and CPM problems.	K_5

K_1 - Remember; K_2 – Understand; K_3 - Apply; K_4 - Analyze; K_5 – Evaluate.

COS-POS MAPPING (COURSE ARTICULATION MATRIX)

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	3	3
CO2	9	9	9	9	3	3	3
CO3	9	9	9	9	3	3	3
CO4	9	9	9	9	3	3	3
CO5	3	3	3	3	1	1	1
Total Contribution of COs to POs	39	39	39	39	13	13	13
Weighted Percentage of COs contribution to POs							
B.SC COMPUTER SCIENCE	2.18	2.33	2.41	2.51	1.31	1.00	0.86
B.C.A	1.78	1.85	1.93	2.16	0.77	0.80	1.12

Level of Correlation: 0–No Correlation; 1–Low Correlation; 3–Medium Correlation;
9- High Correlation between COs and POs

COURSE CONTENT

UNIT-I :   **LINEAR PROGRAMMING PROBLEM**   **(15 Hours)**

Linear Programming -Mathematical Model assumption of linear Programming –

Graphical method -Simplex method (Simple Problems only).

UNIT-II :   **TRANSPORTATION AND ASSIGNMENT PROBLEM**   **(15 Hours)**

Transportation problem-NWC method-Least cost method-VAM method-assignment

problem.

UNIT-III :   **GAME THEORY**   **(15 Hours)**

Game Theory -Concept of Pure and Mixed Strategies –Solving 2 x 2 matrix with

and without saddle point -n x 2 -2 x m games.

UNIT-IV: **RESPLACEMENT**   **(15 Hours)**

Replacement models -Elementary replacement models -Present value -Rate of return

-Depreciation -Individual replacement –Group replacement.

UNIT-V: **CPM**   **(12 Hours)**

Network representation - CPM -Backward pass -Forward pass.

TEXT BOOKS:

1. Manmohan, P.K. Gupta, Kanthiswarup, S (2017) –"Operations Research" Chand & sons.

UNIT	CHAPTER	PAGE
I	2,3,4	39-78, 87, 99-106
II	10,11	247,252-258, 298-314
III	17	443-457
IV	18	477-495
V	25	763-780

REFERENCE BOOKS:

1. Hamdy A Taha (2002) – "Operations Research" Pearson Education, 7[th]edition,

2. P.K. Gupta, D.S. Hira-"Problems in Operations Research",S. Chand Publishers.

WEB REFERENCES:

1.https://en.wikipedia.org/wiki/Operations_research
2.https://www.bbau.ac.in/dept/UIET/EMER-
   601%20Operation%20Research%20Queuing%20theory.pdf
3.https://www.researchgate.net/publication/311694393_SIMPLEX_METHOD

SEMESTER - IV

B.COM / B. COM (I/T) / B.COM C.A DEGREE PROGRAMME

Category	Component	Course Code	Course Title	Contact Hours / Semester	Credits
PART III	CORE : XIV ALLIED : IV	25CGU14 25CIU14 25CCU14	BUSINESS MATHEMATICS AND STATISTICS	60	4

Contact hours per week: 5

Year	Semester	Internal Marks	External Marks	Total Marks
II	IV	25	75	100

PREAMBLE

To enable the students to learn the Statistical methods and their applications in Commerce

COURSE OUTCOME:

After completion of the course, the learners will be able to

COs	CO Statement	Knowledge Level
CO1	To impart knowledge on the basics of Arithmetic, Geometric and Harmonic progressions.	K1
CO2	To learn about simple and compound interest and Annuity.	K2
CO3	To familiarise with the measures of central tendency and measures of Dispersion.	K3
CO4	To conceptualise with correlation co-efficient	K4
CO5	To gain knowledge on time series analysis.	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate.

CO-PO MAPPING (COURSE ARTICULATION MATRIX)

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	9	9	9	9	3	9	3
CO2	9	9	9	9	3	9	3
CO3	9	9	9	9	3	3	1
CO4	9	9	9	9	3	3	1
CO5	9	9	9	9	3	3	0
Total Contribution of COs to POs	45	45	45	45	15	27	8
Weighted Percentageof COs Contribution to Pos							
B.COM	2.46	2.83	2.87	4.05	2.16	3.66	1.29
B.COM (I/T)	2.5	2.9	2.9	3.9	2.3	3.3	8.1
B.COM C.A	2.47	2.79	2.83	3.65	2.27	3.05	1.32

Level of correlation: 0–No correlation; 1–Low correlation; 3–Medium correlation;

9-Highcorrelation between COs and POs.

COURSE CONTENT:

UNIT I: SERIES   (12 Hours)

Arithmetic, Geometric and Harmonic Progressions.

UNIT II: INTEREST AND ANNUITY   (12 Hours)

Simple and Compound Interest - Annuity - Meaning - Types of Annuity Applications.

**UNIT III: MEASURES OF CENTRAL TENDENCY & MEASURES OF DISPERSION
                                                                 (12 Hours)**

Arithmetic Mean, Geometric Mean - Harmonic Mean - Mode and Median. Measures of Variation – Range - Quartile Deviation and Mean Deviation - Variance and Standard Deviation.

UNIT IV: CORRELATION AND REGRESSION   (12 Hours)

Correlation - Karl Pearson's Coefficient of Correlation – Spearman's Rank Correlation-– Regression Lines and Coefficients.

UNIT V: TIME SERIES ANALYSIS   (12 Hours)
Time Series Analysis: Secular Trend and their four methods– Seasonal Variation – Cyclical variations– Irregular Variations.

** Note : Distribution of marks Theory – 20% Problems – 80%

TEXT BOOKS:

Author	Title	Publisher	Year of Publication
Navanitham P A	Business Mathematics and Statistics	Jai publishers, Trichy.	2012

REFERENCE BOOK:

S.No	Authors	Title	Publishers	Year of Publication
1.	Gupta. S.P	Statistical Methods	Sultan Chand & Sons, New Delhi.	2016
2	Vittal. P.R.	Mathematical Statistics	Margham Publishers, Chennai	2016

DISTRIBUTION OF MARKS

DISTRIBUTION OF MARKS AND QUESTION PAPER PATTERN

S. No.	COMPONENT	TOTAL MARKS	DISTRIBUTION OF MARKS		PASSING MINIMUM FOR (ESE)		OVERALL PASSING MINIMUM FOR (CIA & ESE)
			CIA *	ESE **	CIA *	ESE **	
1.	**Theory (Both CIA and ESE)** Core / Allied / Open Elective	100	25	75	--	30	40
2.	**Practical** (Both CIA and ESE)	100	40	60	--	24	40
3.	**100% INTERNAL (ONLY CIA / NO ESE)** Foundation Non-Major Elective Skill Enhancement Ability Enhancement	50	50	--	20	--	20
4.	**100% EXTERNAL (ONLY ESE)** Proficiency Enhancement	100	--	100	--	40	40
5.	Institutional training / Industrial Training / Apprenticeship Training / Mini Project **(ONLY CIA / NO ESE)**	100	100	--	40	--	40
6.	Project Work & Viva Voce **(Both CIA and ESE)**	100	20	80	--	32	40

*Bloom's Taxonomy based assessment pattern – K1 to K5 levels. K6 is also appreciable.

** ONLY CIA indicates 100% CIA course, ONLY ESE indicates 100% ESE appearance, BOTH indicates CIA and ESE components.

2. For Courses - Theory / Practical / Project - (Both CIA and ESE) - Core / Allied / Open Elective:

1.1 For THEORY Courses (BOTH CIA AND ESE):

1.1.1 Distribution of Marks:

SPLIT – UP	COMPONENT	K LEVEL	MARKS		TOTAL MARKS
CIA	**Assignments:** A student is expected to submit three assignments (includes one e-assignment) on any topic relevant to her course as directed by her course instructor based on the assignment schedule provided at the beginning of the semester for every course. K6 - Create level assignments will be appreciated. Marks will be awarded based on concept clarification and justification on the task. **Average marks of the three assignments are considered in this case**. A student can score a maximum of 5 marks from assignments. (1 assignment – online submission of e-assignment, K6 level assignments will be appreciated.	K3	5	Average of 3 assignments 15/3 = 5	25
		K4	5		
		K5	5		
	Seminar: A student shall handle **a seminar** on any topic relevant to her course as directed by her course instructor for which marks shall be awarded based on concept clarification and justification on the task. A student can score a maximum of 5 marks for her seminar.	K2	5		
	Others : A student will be evaluated during the semester on her participation in class, case studies presentation, field work, field survey, group discussion, term paper, participation in workshop/conference, presentation of papers in conferences, surprise / informed quizzes from the respective courses that maybe conducted online / offline with simple multiple choice questions, report / content writing, etc. **Average marks** in these activities will fetch her maximum of 5 marks.	K1 – K5	5		
	CIA I and CIA II tests: A student will be evaluated during the semester in Two CIA tests that would be conducted as per the schedule approved by the academic head. **Average of the two tests** will be considered in this category.	K1 – K5	5		

SPLIT – UP	COMPONENT	K LEVEL	MARKS	TOTAL MARKS
	Model Exam: A student has to appear for the MODEL EXAM that would be conducted as per the schedule approved by the academic head.		5	

1.1.2 CIA, Model Exam and ESE Question paper pattern with K-levels:

i) For CIA Tests – 2 Hour test:

SECTION	MARKS	OBE QP Pattern	No. of questions in Knowledge Levels
A	6*1=6 **(MCQ with 4 options)**	K1- 3 questions K2- 3 questions	K1- 3 K2- 3 K3- 2 K4- 3 K5- 2
B	4*5=20 (Either/Or)	K3- 2 questions K4- 2 questions	
C	3*8=24 (Either/Or)	K4-1 question K5- 2 question	
Total	**50**	▪ **questions**	

ii) For Model Exam and ESE – 3 Hours exam:

SECTION	MARKS	OBE QP Pattern	No. of questions in Knowledge Levels
A	10*1=10 **(MCQ with 4 options)**	Q.No. 1,3,5,7,9 -K1 Q.No. 2,4,6,8,10 -K2	K1- 5 K2- 5 K3- 3 K4- 4 K5- 3
B	5*5=25 (Either/Or)	K3- 3 questions K4- 2 question	
C	5*8=40 (Either/Or)	K4- 2 questions K5- 3 questions	
Total	**75**	**20 questions**	

1.2 For Practical Courses (BOTH CIA and ESE):

SPLIT – UP	COMPONENT	K Level	MARKS	TOTAL MARKS
CIA	**Conduct of Experiments** / Observations *(Minimum 10 experiments)*	K2	10	**40**
	Periodical Lab Tests (Average of TWO) : 10 Marks	K3	25	
	Model Test : 15 Marks	K5		
	Record Work	K1	5	
ESE	**Experiment / Activity: 1** Algorithm/Steps/Procedure/Logic Input/Execution/Observations/Output/Result	K4 K5	10 15	**60**
	Experiment / Activity: 2 Algorithm/Steps/Procedure/Logic Input/Execution/Observations/Output/Result	K4 K5	10 15	
	Record Work*	K1	10	

CIA & MODEL exam Question paper patterns are not defined.

*Record work is MANDATED for appearance in the ESE. Failing to submit will disqualify the candidate from appearing for the ESE.

• There shall be change in the components measured depending on the nature of the course and is left to the discretion of the department.

3. For Internal Only Courses - Theory / Practical / Project

2.1 For THEORY COURSES that are 100% INTERNAL (ONLY CIA / NO ESE - 50 Marks):

Tests	Marks	Knowledge Level	Marks
FINAL EXAM (3 HOURS)	5 Questions 5*10= 50 One question from each unit *(Either / or type)* *Both options from the same unit / same level*	K1,K2,K3,K4,K5 Any Level can be Used	**50**

Note: 100% CIA ONLY, NO ESE.

2.2 For Practical Courses (ONLY CIA- 50 Marks):

SPLIT – UP	COMPONENT	K Level	MARKS	TOTAL MARKS
CIA	**Experiment / Activity: 1** Algorithm / Steps / Procedure / Logic Input / Execution / Observations / Output / Result	K1 - K5 Any Level can be used	10 10	**50**
	Experiment / Activity: 2 Algorithm / Steps / Procedure / Logic Input / Execution / Observations / Output / Result		10 10	
	Record Work*		10	

CIA & MODEL exam Question paper patterns are not defined.

*Record work is MANDATED for appearance in the ESE. Failing to submit will disqualify the candidate from appearing for the ESE.

- There shall be change in the components measured depending on the nature of the course and is left to the discretion of the department.

2.3 For PROJECT Courses (ONLY CIA- 50 Marks):

SPLIT – UP	COMPONENTS	K Level	MARKS	TOTAL MARKS
CIA	Regularity	K1,K2, K3, K4, K5 Any Level can be used	5	**50**
	Review / Presentation		10	
	Knowledge about the organisation / theme of study		10	
	Nature of Work / Logic behind the study		5	
	Learning Outcome		10	
	Viva - Voce		10	

4. For THEORY COURSES that are 100% EXTERNAL (NO CIA / ONLY ESE – 100 Marks):

164

Split-Up	Components	K Level	Total Marks
ESE (3Hrs)	5 Questions 5*20= 100 One question from each unit *(Either / or type)* *Both options from the same unit / same level*	K1,K2,K3,K4,K5 Any Level can be Used	**100**

K1 – 1 Question, K2 – 1 Question, K3 – 1 Question, K4 – 1 Question, K5 – 1 Question

Note: NO CIA, 100% ESE ONLY.

5. Institutional Training / Industrial Training / Apprenticeship Training / Mini Project (ONLY CIA / NO ESE):

4.1 Institutional Training / Industrial Training:

Institutional Training / Industrial Training reports are evaluated (K1 to K5 levels) at the end of semester- V by the **Internal Examiners** only with prior permission and appointment by COE. Following weight ages shall be used to evaluate the Institutional training / Industrial Training report:

COMPONENTS*	K LEVEL	MARKS	TOTAL MARKS
Understanding and articulation of concepts	K1, K2, K3, K4, K5 Any level can be used	30	**100**
Clarity and comprehensiveness of presentation in the report		30	
Structure and neatness of the report		40	

* 100% CIA, NO ESE.

* Different metrics may be evaluated depending on the nature of the work carried out during the training period and is left to the discretion of the department.

4.2 Apprenticeship Training:

Apprenticeship Training reports are evaluated based on the following rules:

1. Each student should undergo 100 hours of Apprenticeship Training during IV and V Semester

course of study.

2. The training report is not less than 30 type written pages should be submitted within one month after the completion of the apprenticeship period.

3. If a student fails to undergo the apprenticeship programme on medical grounds/due to lack of attendance either in the IV semester or in the V semester (or) in both semesters, she should undergo the same after completion of 6th semester. For this prior permission should be obtained from the Principal with the recommendation of the Head of the Department and Controller of Examinations. In such a case training report should be submitted within one month after the completion of the apprenticeship period.

4. In case of failure to submit the report within the above stipulated period, the date of submission may be extended to 15 working days with a late fee as prescribed by the Principal. Further extension, if necessary, may be granted by the College Council on special request.

5. The Apprenticeship report shall be evaluated for a total of 100 marks, out of which 50 marks shall be allotted to the apprenticeship programme to be evaluated by auditor and 50 marks to the apprenticeship report to be evaluated by the Department.

6. A student should secure a minimum of 20 marks each (Auditor & Department) in the apprenticeship programme and 40 marks in the training report to qualify for a pass in the 'Apprenticeship Report'.

7. If any candidate indulges in malpractice while attending the apprenticeship programme or fails to secure a minimum pass mark in the apprenticeship programme as evaluated by the auditor, the report will not be considered for the evaluation by the Department. In that case, student has to undergo Apprenticeship Programme once again and resubmit the report within one month after completion of Apprenticeship Programme.

8. If any candidate fails to secure a minimum pass mark in the 'Apprenticeship Report' as evaluated by the department, the candidate has to resubmit the report after carrying out the suggestions given by thedepartmentwithin10 days after the publication of the results.

The **Reports** are evaluated during the semester by the **Internal Examiners and the Respective Auditor**.

SPLIT - UP	COMPONENTS	K LEVEL	MARKS	TOTAL MARKS

	Work Diary	K1, K2, K3, K4, K5 Any level can be used	10	100
CIA	Evaluation of report by Internal		20	
	Presentation		20	
	Evaluated by Auditor		50	

4.3. Mini - Project:

Departments encouraging project work may adopt the following structure for evaluation of report; else, they shall define their own rubrics as per need. Following components shall be used for evaluation:

The **project reports** are evaluated during the semester by the **Internal Examiners**.

SPLIT - UP	COMPONENTS	K LEVEL	MARKS	TOTAL MARKS
CIA	Regularity	K1, K2, K3, K4, K5 Any level can be used	15	100
	Review / Presentation		15	
	Knowledge about the organisation / theme of study		20	
	Nature of Work / Logic behind the study		10	
	Learning Outcome		20	
	Viva – Voce		20	

*Viva-Voce for projects will be conducted by internal examiners only.**

5. **For Project Work & Viva Voce Courses (BOTH CIA and ESE):**

The **project reports** are evaluated at the end of semester jointly by the **Internal Examiners** and **External Examiner** only with prior permission and as appointment by CoE.

SPLIT – UP	COMPONENTS	K Level	MARKS	TOTAL MARKS
CIA	Regularity	K1, K2, K3, K4, K5 Any level can be used	10	**20**
	Review / Presentation		10	
ESE*	Knowledge about the organisation / Theme of study		20	**80**
	Nature of Work / Logic behind the study		20	
	Learning Outcome		20	
	Viva-Voce*		20	

*__ESE Viva-Voce for projects will be jointly conducted by internal and external examiners.__

- There shall be change in the components measured depending on the nature of the course and is left to the discretion of the department.

GUIDELINES FOR THE COURSES

GUIDELINES FOR SCHOLASTIC COURSES

S. No.	Particulars

1	**Credit transferability for courses**		
2	**For Courses under Part- III:** 2.1 Core Theory / Practical / Allied / Elective / Project Work & Viva Voce		
	2.2. Institutional training / Industrial Training / Apprenticeship Training / Mini Project		
	2.3 Open Elective		
3	**For Courses under Part- IV**		
	3.1. Skill Enhancement		
	3.2. Ability Enhancement		
4	**For Courses under Part- V**		
	4.1. Proficiency Enhancement		
	4.2. Competency Enhancement		
	4.2.1. NSS / YRC / CCC / Physical Education / Others		
	4.2.2. Professional Grooming (Life Skills)		
	4.2.3. Students Social activity (Related to the Curriculum)		

1. **Credit transferability for courses:**

In lieu with the direction of the University Grants Commission (UGC) for universities and colleges to use the Massive Open Online Courses (MOOC) available on the HRD Ministry's 'Swayam' platform for credit transfer, students who complete a course in their curriculum (the courses approved by Swayam board, are ready to be offered in the July semester 2020 AND ONWARDS) are permitted to transfer their credits and can be exempted from appearing the particular course in their curriculum. The score obtained will be accounted for CGPA calculation. The credits earned can be transferred under PART-III/PART-IV/PART-V of ANY SEMESTER with due recommendation of the Chairperson of the Board and approval from the COE.

2. **For courses under PART III :**

Score obtained in these courses WILL BE ACCOUNTED FOR CGPA CALCULATION.

2.1. **Institutional training / Industrial Training / Mini Project:**

Course Code	Semester	Course	Evaluation	Credits
25MAU17A/ 25MAU17B/ 25MAU17C/	V	Institutional training / Industrial training / Mini Project	NO ESE 100% CIA	1

i) Institutional / Industrial Training:

A student shall visit an institution / Industry and learn its operations according to the nature of her discipline of study after approval from the Department, for a period of 21 WORKING DAYS during her summer vacation between semesters IV and V. Work carried out during this period will have to be recorded in a work diary provided by the department. An institutional training report should be submitted by the student at the end of the fifth semester (ESE) to complete the programme and is duly evaluated by the INTERNAL EXAMINER ONLY.

ii) Apprenticeship Training:

A student shall undergo training with a practicing Auditor with due approval from the Department, for 100 Hours during her summer vacation between semesters IV and V. Work carried out during this period will have to be recorded in a work diary provided by the department. An Apprenticeship training report should be submitted by the student at the end of the fifth semester (ESE) to complete the programme and is duly evaluated by the INTERNAL EXAMINER and Respective Auditor. (Only for B.Com PA Students)

iii) Mini Project:

A student shall investigate a problem on the core business activity also pertaining to the nature of her discipline of study with due approval from the Department, for a period of 21 WORKING DAYS during her summer vacation between semesters IV and V. Work carried out during this period will have to be recorded in a work diary provided by the department. A mini project report should be submitted by the student at the end of the fifth semester (ESE) to complete the programme and is duly evaluated by the INTERNAL EXAMINER ONLY.

2.2. Open Elective:

Open elective courses are core courses offered DURING SEMESTER V under Part: III for students of other UG programmes, where a student can choose any course offered under this

category from other than her parent department. Notification is handled on advice of the academic head and enrollment for the course is done on first come first serve basis depending upon the available strength. The course is taught and is administered by the norms pertaining to the department which offers the course. Adherence to the scheme, syllabus, distribution of marks and question paper pattern as found in the curriculum of the parent department is MANDATORY. Score obtained in this course will be accounted for CGPA calculation. Following is the list of courses available for the students of the UG programme.

List of open elective courses offered for the students admitted in UG programmes
From the academic year 2025-2026 and onwards

Course Code	Department	Course	Evaluation	Credit
25TAUOE1	Department of Tamil	jpwd; Nkk;ghl;Lf; fy;tp	Both CIA and ESE	2
25ENUOE1	Department of English	English for effective communication		
25MAUOE1	Department of Mathematics	Mathematics for Business		
25PHUOE1	Department of Physics	Physics in day to day life		
25CSUOE1	Department of Computer Science	Internet For Everyone		
25AMUOE1		Advanced Excel – Practical		
25ITUOE1		Basics of Computer Technology		
25CAUOE1		Machine Learning		
25CYUOE1		Prompt Engineering -Practical		
25CGUOE1	Department of Commerce	Basics of Accounting		
25CUOE1		E- advertising		
25CPUOE1		Human resource management		
25CIUOE1		Fundamentals of Banking		
25BAUOE1	Department of Management	Start-up Business		

3. For courses under PART IV :

Score obtained in these courses WILL NOT BE ACCOUNTED FOR CGPA CALCULATION.

3.1 Skill Enhancement:

Course Code	Semester	Course	Evaluation	Credits
25SEMAU01	IV	Mathematical Software – SPSS -Practical	To be conducted and evaluated by the Internal Examiner 100% CIA NO ESE	2
25SEMAU02	V	Data Analysis using GeoGebra - Practical		2
25SEMAU03	VI	Latex - Practical		2

NOTE: Weekly three hours theory / practical / project activities conducted as individual/group tasks or assignments in direct supervision of faculty member during semesters (IV, V and VI) and the assessment is to be done by the INTERNAL EXAMINER ONLY. NO ESE.

3.2. Ability Enhancement:

Course Code	Semester	Course	Evaluation	Credits
25AEU01	III	Information Security	100% CIA NO ESE	2
25AEU02	IV	Consumer Rights		2

On successful completion of these courses, students will be able to demonstrate skills necessary for tackling challenges in today's digitalized world driven by consumerism. They are also taught relating to the main stream of study and hence, ensure job readiness after completion of the UG programme.

4. For courses under PART V:

Score obtained in these courses WILL NOT BE ACCOUNTED FOR CGPA CALCULATION.

4.1. <u>Proficiency Enhancement:</u>

Course Code	Semester	Course	Evaluation	Credits
25PEMAU01	V	Numerical Aptitude (Self Study)	NO CIA 100% ESE	2

These courses are provided to enhance the academic proficiency of a student. No lecture hours are provided and therefore, these are SELF STUDY courses and the students are expected to prepare the courses on the prescribed syllabi by their own. Students have to appear for the ESE that would be conducted as per the curriculum specification of each department and scoring a passing minimum is mandatory for completion of the UG programme.

4.2. Competency Enhancement:

Competency enhancement activities are conducted by the college / department between semesters I and IV or I and VI, as is applicable. Evaluation is done under Part: V for 3 credits and credits are awarded based on submission of proofs for completion of the components mentioned therein. Obtaining a grade is MANDATORY for completion of the UG programme.

4.2.1. NSS / YRC / CCC / Physical Education/ Others:

Semester	CATEGORY	Course Completion	Credit
I - VI	NSS/ YRC/ CCC/ Physical Education/ Others	Upon personal choice and as guided by faculty mentor	1

A student can choose to involve and engage in activities that college / department and her faculty mentors plan under NSS/ YRC/ CCC/ Physical Education/ Others to instill social consciousness, citizenship, moral building and serve her immediate community. Submission of a certificate of completion as a proof, to the class tutor is MANDATORY.

4.2.2. Professional Grooming:

Semester	Category	Course Completion	Credit
I - IV	Professional Grooming (Life Skills)	As guided by faculty mentor	1

Students will be taught to care take of themselves and their body, and it's something everyone can and should do. This component is included to cultivate professionalism amongst students and educate them with strategies aimed at enhancing knowledge, skills and abilities in becoming a professional. Submission of a certificate of completion as a proof, to the class tutor is MANDATORY.

4.2.3. Students Social activity (Related to the Curriculum):

Semester	Category	Course Completion	Credit
I - VI	Students Social activity (Related to the Curriculum)	As guided by faculty mentor	1

A student shall engage in activities that her department and apply the knowledge gained in her curriculum in addressing some pressing issues of her neighborhood for societal good. Submission of a certificate of completion as a proof, to the class tutor is MANDATORY.

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CIA QUESTION PAPER PATTERN:PART – III – CORE COURSES: 50 MARKS

P.K.R. ARTS COLLEGE FOR WOMEN, GOBI
(Re-Accredited with 'A' Grade by NAAC)
Autonomous Institution- Affiliated to Bharathiar University
DEPARTMENT OF_____
Academic Year: _____
Continuous Internal Assessment I/II: Month/Year

Class	Course Code	Course Title

Time: 2 Hours   **Maximum Marks: 50**

Answer ALL the Sections
SECTION – A   (6 × 1 = 6 Marks)
(Bloom's Taxonomy K1 / K2 Level)
(Multiple Choice Questions)

Answer the following

S. No.	Question	KNOWLEDGE LEVEL
	a) b) c) d)	
	a) b) c) d)	
	a) b) c) d)	**K1- 3 Questions**
	a) b) c) d)	**K2- 3 Questions**
	a) b) c) d)	
	a) b) c) d)	

SECTION – B   (4 × 5 = 20Marks)
(Bloom's Taxonomy K3 / K4 Level)
(Options (a) and (b) should be from same unit and same knowledge level)
Answer ALL Questions

S. No.	Question		KNOWLEDGE LEVEL
7.	(a)	(OR)	
	(b)		
			K3- 2 Questions
8.	(a)	(OR)	
	(b)		**K4- 2 Questions**
9.	(a)	(OR)	
	(b)		

10.	(a)		**(OR)**	
	(b)			

SECTION – C (3 × 8= 24 Marks)
(Bloom's Taxonomy K4 / K5 Level)
(Options (a) and (b) should be from the same unit and same knowledge level)
Answer ALL Questions

S. No.		Question		KNOWLEDGE LEVEL
11.	(a)	Unit I	**(OR)**	K4- 1 Question
	(b)	Unit I		
12.	(a)	Unit II	**(OR)**	K5- 2 Questions
	(b)	Unit II		
13.	(a)	Unit III	**(OR)**	
	(b)	Unit III		

CIA QUESTION PAPER PATTERN: PART IV– FOUNDATION COURSES
SKILL ENHANCEMENT – I, II, III : 50 MARKS

P.K.R. ARTS COLLEGE FOR WOMEN, GOBI
(Re-Accredited with 'A' Grade by NAAC)
Autonomous Institution- Affiliated to Bharathiar
University
DEPARTMENT OF_____

Academic Year: _____
Month/Year:_____

Class	Course Code	Course Title

Time: 3 Hours   **Maximum Marks: 50**

SECTION – A   (5× 10 = 50 Marks)
(Bloom's Taxonomy K1 / K2 / K3 / K4 / K5 Level)
(Options (a) and (b) should be from same unit and same knowledge level)
Answer ALL Questions

S. No.		Question		KNOWLEDGE LEVEL
1.	(a)		(OR)	
	(b)			
2.	(a)		(OR)	**K1- 1 Question**
	(b)			
				K2- 1 Question
3.	(a)		(OR)	**K3- 1 Question**
	(b)			
				K4- 1 Question
4.	(a)		(OR)	
	(b)			**K5- 1 Question**
5.	(a)		(OR)	
	(b)			

PART – III CORE COURSES: 75 MARKS

Course Code: ……………..   Reg. No. :

P.K.R ARTS COLLEGE FOR WOMEN (Autonomous), GOBICHETTIPALAYAM
…UG…. DEGREE ESE EXAMINATION, …… − 2025-26
Branch − ………………….
Semester …..
(For the candidates admitted from 2025-26)
< Title of the Subject >

Time: 3 Hours   **Maximum Marks: 75**

Answer ALL the Sections
SECTION – A   (10 × 1 = 10 Marks)
(Bloom's Taxonomy K1 / K2 Level)
(Multiple Choice Questions)

Answer the following

S. No.	Question	KNOWLEDGE LEVEL
1.	Unit I a) b) c) d)	**K1**
2.	Unit I a) b) c) d)	**K2**
3.	Unit II a) b) c) d)	**K1**
4.	Unit II a) b) c) d)	**K2**
5.	Unit III a) b) c) d)	**K1**
6.	Unit III a) b) c) d)	**K2**
7.	Unit IV a) b) c) d)	**K1**
8.	Unit IV a) b) c) d)	**K2**
9.	Unit V a) b) c) d)	**K1**
10.	Unit V a) b) c) d)	**K2**

SECTION – B   (5 × 5 = 25 Marks)
(Bloom's Taxonomy K3 / K4 Level)
(Bloom's Taxonomy: K3 – 3 questions, K4 – 2 questions)
(Options (a) and (b) should be from same unit and same knowledge level)
Answer ALL Questions

S. No.		Question		KNOWLEDGE LEVEL
11.	(a)	Unit I	(OR)	
	(b)	Unit I		
12.	(a)	Unit II	(OR)	
	(b)	Unit II		
13.	(a)	Unit III	(OR)	
	(b)	Unit III		
14.	(a)	Unit IV	(OR)	
	(b)	Unit IV		
15.	(a)	Unit V	(OR)	
	(b)	Unit V		

SECTION – C   (5 × 8 = 40 Marks)
(Bloom's Taxonomy K4 / K5 Level)
(Bloom's Taxonomy: K4 – 2 questions, K5 – 3 questions)
(Options (a) and (b) should be from the same unit and same knowledge level)
Answer ALL Questions

S. No.		Question		KNOWLEDGE LEVEL
16.	(a)	Unit I	(OR)	
	(b)	Unit I		
17.	(a)	Unit II	(OR)	
	(b)	Unit II		
18.	(a)	Unit III	(OR)	
	(b)	Unit III		
19.	(a)	Unit IV	(OR)	
	(b)	Unit IV		

20.	(a)	Unit V	**(OR)**	
	(b)	Unit V		

K –LEVEL	Q.NO.	No. of Questions
K1	1,3,5,7,9	5
K2	2,4,6,8,10,	5
K3	3 QUESTIONS IN SECTION B	3
K4	2 QUESTION IN SECTION B 2 QUESTIONS IN SECTION C	4
K5	3 QUESTIONS IN SECTION C	3
	TOTAL	**20 QUESTIONS**

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PART – V – COURSES: 100 MARKS

Course Code: ....   **Reg. No. :**

P.K.R ARTS COLLEGE FOR WOMEN (Autonomous), GOBICHETTIPALAYAM
…UG…. DEGREE ESE EXAMINATION,........... – 2025-26
Branch – ………………….
Semester …..
(For the candidates admitted from 2025-26)
< Title of the Subject >

Time: 3 Hours   **Maximum Marks: 100**

Answer ALL the Questions
SECTION – A   (5 × 20 = 50 Marks)
(Bloom's Taxonomy K1 / K2 / K3 / K4 / K5 Levels)
(Options (a) and (b) should be from same unit and same knowledge level)
Answer ALL Questions

S. No.		Question		KNOWLEDGE LEVEL
1.	(a)	Unit I	**(OR)**	
	(b)	Unit I		
2.	(a)	Unit II	**(OR)**	
	(b)	Unit II		
				K1 – 1 Question,
3.	(a)	Unit III	**(OR)**	K2 – 1 Question, K3 – 1 Question,
	(b)	Unit III		K4 – 1 Question,
				K5 – 1 Question
4.	(a)	Unit IV	**(OR)**	
	(b)	Unit IV		
5.	(a)	Unit V	**(OR)**	
	(b)	Unit V		

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CO-SCHOLASTIC COURSES OFFERED FOR THE STUDENTS ADMITTED IN THE UG PROGRAMMES IN 2025-26 AND ONWARDS

CO - SCHOLASTIC COURSES FOR UG PROGRAMMES:

The co-scholastic courses are offered with an intention to provide learner centric, skill oriented technical training that help an individual to showcase their competency, learn commitment for the profession, add value and build expertise in their area of study and helps with job advancement / career building opportune for students of all UG programmes. Evaluation in this category is done by INTERNAL EXAMINERS / COMPETENT CERTIFYING PROFESSIONAL BODIES / PROFESSIONAL INSTITUTIONS as is required, at the end of the semester/ an academic year. Score obtained in this category WILL NOT BE ACCOUNTED FOR CGPA CALCULATION.

Every course is taught 40 Hours in an academic year and assessment is made at the end of the even semester (ESE ONLY). Students who score the passing minimum will be given certificates with grades, based on the marks scored during the final Examination.

Following are the co-scholastic courses offered for the students admitted in the UG programmes during the academic year 2025-26 and onwards:

Categories available for students admitted in UG Programmes:

1. VALUE ADDED COURSES
2. CERTIFICATE COURSES
3. EXTRA CREDIT COURSES

are the THREE categories of CO-SCHOLASTIC COURSES offered to nurture - choice based skill / ability / proficiency / competency enhancement of an individual in addition to the courses specified under the scheme of examinations for scholastic courses of the UG programmes.

Scheme of examination for Co-Scholastic Courses:

1. VALUE ADDED COURSES:

Pattern	Department	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ annual Exam		
						Theory	Practical	Total
Course to be taught after regular hours								
Value Added Course I								
I YEAR								
Annual	All UG Programmes	25VAU1	Fundamental Mathematics and Communication Skills	2 (Sem I) 2 (Sem II)	3	100	-	100
Value Added Course II								
II Year								
Annual	All UG Programmes	25VAU2	Number Analogies and Comprehensive Evaluation	2 (Sem III) 2 (Sem IV)	3	100	-	100
Value Added Course III								
III Year								
Annual	All UG Programmes	25VAU3	Spatial Ability	2 (Sem V) 2 (Sem VI)	3	100	-	100

2. CERTIFICATE COURSES:

Sem	Dept	Course Code	Course Title	Contact Hours / week	Exam Duration Hours	Max. Marks @ Annual Exam		
						Theory	Practical	Total
Course to be taught after regular hours								
Certificate Course								
III & IV (Annual)	Tamil	25TACCU1	jkpoff; Nfhtpy; fiyfs;	2Hrs SEM III 2Hrs SEM IV	3	100 -	- 100	100 100
	English	25ENCCU1	English for Competitive Examinations					
	Mathematics	25MACCU1	C PROGRAMMING					
	Physics	25PHCCU1	Basic Electronics					
	Computer Science	25CSCCU1	CCNA:INTRODUCTION TO NETWORKS					
		25ITCCU1						
		25BCCCU1						
		25AMCCU1						
		25CYCCU1						
	Commerce	25CGCCU1	Goods and Services Tax					
		25CCCCU1	Goods and Services Tax					
		25CPCCU1	Forensic Accounting					
		25CTCCU1	Goods and Services Tax					
	Management	25BACCU1	Accounting Executive with GST					

3. **EXTRA CREDIT COURSES (Self-study courses)**

There are five categories, namely,

3.1 Courses offered by the parent department for all students of the programme (excluding elective choices by the candidate)

3.2 Courses offered by parent department for ADVANCED LEARNERS OF THE PROGRAMME

3.3 Inter-disciplinary courses offered in a department under PART-III for STUDENTS OF OTHER PROGRAMMES.

3.4 Credit transferability for Disciplinary / Inter-disciplinary /Trans-disciplinary / General courses offered in UGC SWAYAM MOOCS

3.5.Comprehension Courses

3.1 Courses offered (Not Chosen electives by the candidate) by parent department for ALL STUDENTS OF THE PROGRAMME: Refer to the scheme of examinations of the programme for the list of courses.

3.2 List of courses offered for ADVANCED LEARNERS ONLY:

Department	Course Code	Courses offered for ADVANCED LEARNERS ONLY
Department of English	25ENALU1	Dalit literature
	25ENALU2	Science fiction
	25ENALU3	Indian Diasporic literature
	25ENALU4	Literature and Mythology
Department of Tamil	25TAALU1	மக்கள் ஊடகத் தொடர்பியல்
	25TAALU2	இணையம் கற்போம்
	25TAALU3	இந்தியக் கலை வரலாறு
	25TAALU4	அரவாணிகள் அன்றும் இன்றும்
Department of Mathematics	25MAALU1	Numerical Techniques
	25MAALU2	Matrix theory
	25MAALU3	Group Theory
	25MAALU4	Vedic Mathematics
Department of Physics	25PHALU1	Digital Literacy
	25PHALU2	Python Programming
	25PHALU3	Acoustics
	25PHALU4	Theory of Relativity
Department of Computer Science	25CSALU1	Block chain technology
	25CSALU2	Introduction to Data Compression
	25CSALU3	Green marketing management
	25CSALU4	Mobile commerce
Department of Commerce	25CGALU1	Event management
	25CGALU2	Secretarial practices
	25CGALU3	Business Legislations
	25CGALU4	E-Governance
Department of Management	25BAALU1	Digital marketing
	25BAALU2	Tourism & Hospitality management
	25BAALU3	Stress management & Emotional intelligence
	25BAALU4	Export management

3.3 Courses offered in a department under PART-III for STUDENTS OF OTHER PROGRAMMES – Inter-disciplinary courses - Refer to the scheme of examinations of the UG programmes for the list of courses.

3.4 Credit transferability for Disciplinary / Inter-disciplinary / Trans-disciplinary / General courses offered in UGC SWAYAM MOOCS: Refer to the UGC SWAYAM eligibility, guidelines for courses available in the official website.

3.5. Comprehension Courses:

Department	Course Code	Comprehension Courses
Department of Tamil	25TAU1	Comprehension in Tamil - I
	25TAU2	Comprehension in Tamil - II
	25TAU3	Comprehension in Tamil - III
	25TAU4	Comprehension in Tamil - IV
	25TAU5	Comprehension in Tamil - V
	25TAU6	Comprehension in Tamil - VI
Department of English	25ENU1	Comprehension in English - I
	25ENU2	Comprehension in English - II
	25ENU3	Comprehension in English - III
	25ENU4	Comprehension in English - IV
	25ENU5	Comprehension in English - V
	25ENU6	Comprehension in English - VI
Department of Mathematics	25MAU1	Comprehension in Mathematics - I
	25MAU2	Comprehension in Mathematics - II
	25MAU3	Comprehension in Mathematics - III
	25MAU4	Comprehension in Mathematics - IV
	25MAU5	Comprehension in Mathematics - V
	25MAU6	Comprehension in Mathematics - VI
Department of Physics	25PHU1	Comprehension in Physics - I
	25PHU2	Comprehension in Physics - II
	25PHU3	Comprehension in Physics - III
	25PHU4	Comprehension in Physics - IV
	25PHU5	Comprehension in Physics - V
	25PHU6	Comprehension in Physics - VI

	25CSU1	Comprehension in Computer Science - I
Department of Computer Science	25CSU2	Comprehension in Computer Science - II
	25CSU3	Comprehension in Computer Science - III
	25CSU4	Comprehension in Computer Science - IV
	25CSU5	Comprehension in Computer Science - V
	25CSU6	Comprehension in Computer Science - VI
Department of Commerce	25CGU1	Comprehension in Commerce - I
	25CGU2	Comprehension in Commerce - II
	25CGU3	Comprehension in Commerce - III
	25CGU4	Comprehension in Commerce - IV
	25CGU5	Comprehension in Commerce - V
	25CGU6	Comprehension in Commerce - VI
Department of Management	25BAU1	Comprehension in Management - I
	25BAU2	Comprehension in Management - II
	25BAU3	Comprehension in Management - III
	25BAU4	Comprehension in Management - IV
	25BAU5	Comprehension in Management - V
	25BAU6	Comprehension in Management - VI

In the comprehension component, students are tested on their grasping ability of the courses of study. Comprehension in ……. - I, II, III, IV, V, VI are SELF-STUDY courses that have only MCQ from Part III Courses. ONLINE EXAMINATION (END-SEMESTER) consisting of 50 Multiple Choice Questions (on Core and Core Elective courses studied in the respective semesters) will be conducted at the end of each semester I, II, III, IV,V and VI , for a maximum of 100 marks.

Self Study: Online Exams will be conducted at the end of each semester with one credit each.

Distribution of Marks and QP Pattern for Value Added Courses:

Department	Category	QP Pattern		Total Marks	Passing Minimum @ Annual Exam	Grade
Tamil	Theory	5*20=100 (Any 5 out of 8 Questions)		100	40	Marks 90 - 100 - A++ Outstanding
All UG Programmes (Except Tamil)	(Online Exam) MCQ	Aptitude Test = 25 Marks		50		Marks 80 – 89 - A+ Excellent
		Soft Skill Test = 25 Marks				Marks 70 – 79 - A Very Good
		Self Introduction		10		Marks 60 - 69 - B+ Good
		Group Discussion		15		Marks 50 – 59 - B Average
		Personnel Interview		15		Marks 40 – 49 - C Satisfactory
		Resume		10		Marks 0 - 39 - U Re-appear
		TOTAL		100		

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