

PHYSICS

Core theory course (Disciplinary)

CPH-701: MATHEMATICAL PHYSICS -II AND QUANTUM MECHANICS - II

UNIT - I

Tensor analysis :

Introduction , Defination, Contravariant vector, Covariant vector, Defination of Tensors of rank two, addition & subtraction of tensor, summation convention, symmetry - anti symmetry of second rank tensor, Contraction, Direct product, Quotient rule, Pseudo tensors Dual tensor Levi-civita symbol, irreducible tensor, Non cartesian tensors, Matrc tensor christoffel symols,christoffel symbols asderivatives of matric tensor,covariant derivative, Tensor derivative operators.

Basic reference :

Mathematical Methods for Physicist by G.B. Afrken& H. J. Weber 5th Edition 2001
Harcot (India Pvt.Ltd.)

UNIT - II

Group theory :

Groups, subgroups and classes, Invariant, subgroups and factor groups, Homomorphism & Isomorphism, Group representation, Reducible & Irreducible representations, Schur's lemma, Orthogonality theorem, Character of representation,Character table, Decomposing a reducible representation into Irreducible ones, Construction of representations, Lie groups & Lie algebra, The Three dimensional rotation groups SO(3), The special unitary groups SU(2) and SU(3), The homomorphism between SU(2) & SU(3), Some application of group theory in physics, (application- 4 classification of elementy particles)

Basic reference :

Mathematical physics by P.K.Chattopahyay, 1990 New age international (P) Ltd, New Delhi.

UNIT - III

Scattering theory :

The scatteing cross-section. General considerations: Kinematics of scattering process; Differential and Totalcross-sections, Wave mechanical picture of scattering:- The scattering amplitude, Green functions : Formal expression for scattering Amplitude, The Born and Eikonal Approximations, The Born Approximation, The validity o f the Born Approximation, The Born series, The Eikonal Approximation .

Basic reference :

A textbook of Quantum mechanics by P. M. Mathews and K. Venkatesan 1976 TMH New Delhi.

UNIT – IV

Partial Wave Analysis :

Asymptotic Behaviour of partial waves : phase shift, The scattering Amplitude in terms of phaseshifts, The Differential and Total cross-sections, Optical Theorem , Phace shift: relation to the potentials, Potentials of finite range, Low energy scattering, Exac soluble problems, Scattering by a square well, scattering by a hard sphere, scattering by a coulumb potential mutual scattering of two particles , Reduction of the two body problem : The centre of mass frame , Transfomation from centre of mass to Laboratory frame of reference , collisions between identical particles.

Basic reference :

A textbook of Quantum mechanics by P. M. Mathews and K. Venkatesan 1976 TMH New Delhi.

Other references :

- (1) Mathematical Methods in Physical Sciences by M.L. Boas, John Wiley&Sons
- (2) Mathematical Physics by H. K. Dass.
- (3) Mathematical Physics by Styaprakash, S.Chand.
- (4) Quantum Mechanics by L. I. Schiff, McGraw-Hill International student edition (1961).
- (5) Quantum Mechanics Vol I & II A. Messiah, Jhon Wiley & Sons, INC (19 68)
- (6) Introduction to Quantum Mechanics by Powell and Crasemann Addiso -Wesley (1961).
- (7) Quantum Mechanics by V.K. Thankappen, Wiely eastern Ltd.
- (8) Quantum Mechanics : Theory and applications by A. Ghatak and S. Lokanathan.

Core theory course (Disciplinary)

CPH-702: SOLID STATE PHYSICS-II AND ELECTRONICS-II

UNIT- I

Imperfections in Crystals:

Point Imperfections, Line Imperfections: Dislocations, Stress fields of Dislocations, Planar Imperfections: grain boundaries, Role of dislocation in Crystal growth, Strength of alloys.

UNIT- II

Magnetism:

Diamagnetism, Paramagnetism, Magnetic resonance: ESR, NMR, Spin relaxation, Weiss theory of Ferromagnetism, The exchange interaction, The Heisenberg model, Ferromagnetic domains: The Bloch wall, Origin of domains, Neel model of Anti ferromagnetism, Neel model of Ferrimagnetism, Spin waves: Magnons in Ferromagnets, The Bloch $T^{3/2}$ law, Magnons in antiferromagnets.

Basic Reference:

Elements of Solidstate Physics by J.P Srivastava, PHI-New Delhi. (For U-I&II)

UNIT- III

FET Amplifiers:

FET parameters, biasing the FET , basic FET amplifier, FET small signal, common source amplifier, The common drain or source follower, common gate amplifier, general treatment of low frequency common source and common drain amplifier.

Basic reference:

Handbook of Electronics 30th revised edition 2002 by Gupta and Kumar (P. P. M) Chapter: 13

Power supplies (Electronic regulation):

Basic blocks of linear voltage regulation, Basic voltage regulation building blocks, protection circuitry, Adjustable type 723 regulator, Typical regulator circuit using 723 IC , Three terminal voltage regulator, General feature, Threeterminal fixed voltage regulator ICs, and their design

Basic reference:

Integrated circuits 9th Edition First Print 1997 By K.R.Botkar, Khanna Publishers Delhi.

UNIT-IV

Tuned voltage amplifiers:

Introduction , Tuned amplifiers, Resonance, Series resonant circuit, Parallel resonant circuit, Advantage of tuned amplifiers, voltage gain and Frequency response curve, Doubled tuned voltage amplifiers.

Basic reference:

Electronic & radio engineering 9th Edition reprint 2002 by M.L.Gupta(D R publi-Shers co.)

IC Fabrication:

IC Technology, Advantages and limitations of ICs, Basic monolithic IC technology, Basic processes used in monolithic technology, Monolithic integrated components, Transistors of monolithic ICs, Monolithic diodes.

Basic reference :

Handbook of Electronics by Gupta and Kumar, Pragati prakashan, Meerut,30th revised edition 2002.

Other references :

1. Introduction to Solid state Physics by Kittel C., Wiley Eastern
2. Fundamentals of Solid State Physics by Saxena, - Gupta- Saxena, Pragati Prakashan
3. Integrated Electronics by Milmann and Halkais
4. Electronic devices and circuits by Y.N.Bapat

PROJECT WORK

- Project Report
- Project Presentation
- VIVA

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATA N

M.Sc. Programme : Semester - IV

Soft Skill Course in Physics

EPH-701: English language communication

Total Credit: 2

Exam duration: 2 hours

Teaching Time: 2(Hours/week)

Total (External) Marks: 50

Unit I

Theory of Communication: Definition & process of Communication [3*], Objectives of Communication [6-20**], Barriers to effective Communication [52 -61 **]

Structure and layout of letters: Elements of structure, forms of layout, Styles of presentation [19-33*]

Modern office technology: Computer, Fax, E-mail, Duplication Technology: Duplication, Photo copy, Printing, Storage Devices [110-117*]

Job application and how to make a resume [78-81*]

Unit-II Language Work:

1. Tenses, Preposition, Vocabulary, Confusables***
2. Comprehension or précis writing.

Reference Books:

****Essentials of Business Communication**

Publisher: S Chand & Sons
By Rajendra Pal and J S Korlahalli
Seventh Revised Edition,
Reprint 1996

***Business Correspondence and Report Writing**

Publisher: Tata Mac. Co. Ltd
By R C Sharma and Krishna Mohan
9th Reprint, 1998.

List of Confusables***

Aboard	Avoid	Cite	Dear	Emigrant
Abroad	Evade	Site	Deer	Immigrant
Accept	Bail	Coast	Defer	Fair
Except	Bale	Cost	Differ	Fare
Access	Berth	Complement	Deficit	Foreword
Excess	Birth	Compliment	Deficiency	Forward
Adapt	Beside	Confidant	Deny	Industrial
Adopt	Besides	Confident	Refuse	Industrious
Addition	Boast	Continual	Depose	Judicious
Edition	Boost	Continuous	Dispose	Judicial
Affect	Carton	Credible	Draft	Loose
Effect	Cartoon	Creditable	Draught	Lose
Alternate	Check	Damage	Eligible	
Alternative	Cheque	Damages	Illegible	

Paper Structure

EPH-701: English language communication

Duration: **2 Hrs**

Total Marks: **50**

Unit-I

- | | | |
|-------|--|----------------|
| 1. a. | Theory of communication | 6 Marks |
| b. | Structure and layout of letters | 6 Marks |
| c. | Modern office technology | 6 Marks |
| d. | Job application and how to make a resume | 7 Marks |

Unit-II

- | | | |
|-------|---------------------------------|-----------------|
| 2. a. | Grammar | 15 Marks |
| b. | Comprehension or précis writing | 10 Marks |
-

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATA N

M.Sc. Programme : Semester - IV

Soft Skill Course in Physics

EPH-702: Personality development

Total Credit: 2

Exam duration: 2 hours

Teaching Time: 2(Hours/week)

Total (External) Marks: 50

Unit 1

- What is personality?
- Theories of Personality.
- Psychoanalytical theories.
- Trait theories, Behaviorist view, Skinner, Social learning theory, Phenomenological perspectives.

Unit 2

- Personality Development: Physical Aspects for Male and Female.
- Hygiene, Habits and Fitness.
- Communicating Skills.
- Non-verbal Communication.

Reference Books:

IGNOU study material for Personality Development.

Paper Structure

EPH-702: Personality development

Duration: 2 Hrs

Total Marks: 50

- | | | |
|---------------|--|-----------|
| 1. | Short answer type questions. (10 out of 12) (Each of 1 Mark) [At least 4 questions from each Unit] | 10 |
| 2 (A) | Medium type questions (3 out of 5) (Each of 4 Mark) [only from Unit-I] | 12 |
| 2. (B) | Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-I] | 08 |
| 3 (A) | Medium type questions (3 out of 5) (Each of 4 Mark) [only from Unit-II] | 12 |
| 3. (B) | Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-II] | 08 |

PPH- 701: PRACTICALS

Group – I

1. Babinet compensator
2. Fiber Optics
3. Microwave
4. Fiberless optical communication using IR
5. C Programming
6. Microprocessor
7. e/m by Helical method

Group – II

1. Study of Differentiator
2. Study of Integrator.
3. D/A and A/D Convertor.
4. Sawtooth generator using OP-AMP
5. Square wave generator.
6. Modulo n-counter.
7. Crystal Oscillator

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MATHEMATICS

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY
PATAN- 384 265**

**Proposed details of CBCS PROGRAMME Pattern
for M Sc Mathematics(Semester System)**

With effect from June : 2014 NEW

FACULTY : SCIENCE

SUBJECT : MATHEMATICS

CLASS: Master of Science.

SEMESTER : I to IV

TOTAL PAGE 01 TO 33 (WITH COURSE STRUCTURE)

DATE : 15th September -2014

M Sc in Mathematics : PROGRAMME Structure Under CBCS

With effect from June : 2014

**M. B. Prajapati, Department of Mathematics,
Hemchandracharya North Gujarat University, Patan-384265.**

(1) Department's VISION and Mission :

The Department of Mathematics is a premier academic institute in the North Gujarat region. The Department was established in June-1993 to cater the need of this region for higher education in the mathematical field.

Mission : Our mission is to provide opportunities for developing high-quality mathematical skills and achievement for their betterment of life through scientific and technological development.

Learning outcomes: Logical Reasoning & Motivation ;Critical & Creative Thinking; Analysis & Problem solving; Information & Technology Proficiency.

Vision: To motivate Individuals to excel in the mathematical knowledge-driven environment of the 21st century through curriculum and train integrally human resources through teaching, research & extension to enhance and initiate human development and the quality of life.

We **Focus** on quality education and innovative research, activities reflecting the goals and objectives of the institution.

Presently, we teach and emphasize student's creativity, excellence, integrity through course work, extracurricular activities, advising and counseling, academic process and reach-as-we-practice.

(2) EDUCATIONAL AIMS :

Mathematics is one of the fundamental disciplines in science. It is the basic for all the disciplines. To make education more effective and learner centric, restructurisation of curriculum becomes essential. As a positive step in this direction and in order to respond to the emerging trends in the global scenario, it is decided to introduce the Choice Based Credit System (CBCS) from the academic year 2011-12. Under this system, the academic programme becomes student-oriented, relevant, interdisciplinary and flexible. Apart from the core subjects the student is at liberty to choose subjects of his/her choice offered by the department also. Besides, the student has an opportunity to learn extra subjects, for which classes will be conducted outside the regular working hours and he/she can earn extra credit in addition to the mandatory credits required of him/her to qualify for the degree, in accordance with the norm prescribed by the Department/University from time to time and availability of the academic infrastructures.

- General Objectives of Choice Based Credit System are as follows:

1. To enlarge and enrich the curriculum and to make education broad based, i.e., more knowledge and skill oriented.
2. To ensure flexibility in choosing intra and interdisciplinary subjects, according to the choice of the students.
3. To enable the interested students to earn extra credits.
4. To facilitate the students to learn at their own pace.

Besides all the above aspects, the MSc programme under CBCS in Mathematics is designed for B. Sc. Mathematics Students if he/she want to continue his/her studies by delving more deeply into particular aspects of pure , applied or applicable mathematics also.

(3) CONDITIONS FOR ADMISSION :

A candidate who has passed the B.Sc. Degree examination of this University with Mathematics or any other examinations accepted by the Syndicate as equivalent thereto shall be eligible for admission to this M Sc Programme in Mathematics on full-time basis of study.

INTAKE: 30 students but may vary from time to time with the permission from the university for the first semester. Other rules for admission are as per University notification from time to time.

Students are allowed to take admissions to successive semesters under carry over benefit facility.

(4) LEARNING OUTCOMES (Objectives and Aim)

The programme leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding in the following areas:

- **Knowledge and understanding**

When one has completed this degree he/she will have knowledge and understanding of:

- the fundamental and advanced concepts, principles and techniques from a range of topic areas
- specific knowledge and understanding will be determined by his/her particular choice of courses, according to his/her particular needs and interests.

- **Cognitive skills**

When one has completed this degree he/she will be able to:

- understand how to solve some problems using the methods taught
- assimilate complex mathematical ideas and arguments
- develop abstract mathematical thinking
- develop mathematical and physical intuition.

- **Practical and/or professional skills and Key skills**

When you have completed this degree, you will be able to demonstrate the following skills:

- the ability to advance your own knowledge and understanding through independent learning
- communicate clearly knowledge, ideas and conclusions about mathematics
- develop problem-solving skills and apply them independently to problems in pure ,applied and applicable mathematics
- communicate effectively in writing about the subject
- improve his/her own learning and performance.

(5) ***DURATION OF THE COURSE:***

The CBCS pattern M. Sc. programme with multidisciplinary approach in Mathematics is offered on a full-time basis. The duration of the course is of two academic years consisting of four semesters each of 15 weeks duration.

(6) ***TEACHING, LEARNING METHODS :***

All relevant material is provided and taught in the course texts and through the study of set books. One will build up knowledge gradually, with sufficient in-text examples to support one's understanding. He/She will be able to assess his/her own progress and understanding by using the in-text problems and exercises at the end of each unit. Opportunity to engage with what is taught is provided by means of the assignment questions and understanding will be reinforced by personal feedback from the teacher in the form of comments based on the answers to one's assignments, seminars, unit-tests and project.

(7) ***COURSE OF STUDY :***

The curriculum has seven major components:

- 1 Core / Principle / Fundamental Mathematical courses
- 2 Pure Mathematical Courses
- 3 Applied Mathematical Courses
- 4 Applicable / Application Oriented Mathematical Courses(disciplinary)
- 5 Soft Skill Based Courses (Inter-disciplinary)
- 6 Open Choice Based Courses (Disciplinary/Inter-disciplinary)
- 7 Cognitive Skill-Work Based Courses

There are at least total twenty COURSEs prescribed in the following classification, to be studied to acquire M.Sc. Degree in Mathematics.

(I) Principle/Core/Compulsory Courses (HARD CORE): (MTHP-1 to 8)

All Basic/Core courses carry 5 credits in 5 hours per week teaching and in each semester any two core courses to be selected from the list of MTHP_Group (various groups are listed on page number **10**)

with no repetitions i.e. there are total 8 Mathematical Core Courses to be selected from semester-I to semester-IV.

(II) Elective Disciplinary COURSEs (SOFT CORE): (MTHE-1 to 4)

All elective courses carry 4 credits in 4 Hours per week teaching. During the span of the programme, there are 4 Mathematical Elective Courses to be chosen from the lists of COURSEs of not more than Two groups : Three groups are *Group-A (Pure Mathematical Group)* , *Group-B(Applied Mathematical Group)* and *Group-C(Applicable Mathematical Group)*

(III) Choice Based Optional Courses: CB_Group (MCB-1 to 3)

All Choice based(disciplinary as well as inter-disciplinary) courses carry 2 credits in 2 hours per week teaching and there are 3 COURSEs to be chosen from the list of CB_Group.

(IV) Soft Skill Based Courses : SB_Group (SSB-1 to 4)

All Soft-skill based courses carry 2 credits in 2 hours per week teaching and 4 hours for practical. There are total 4 Courses to be chosen from the list of SSB_Group.

(V) Either Cognitive Skill-Work Project : MTHW_Group (MTHW)

OR

MTHE -5 ,MTHE-6 (selected from soft core subjects & MCB-4 (selected from CB group)

⇒ COURSE STRUCTURE ☒

SEMESTER-I	Courses	Credit /course	Teaching Hrs Total	Total Credits	Examination			Total Marks
Course					Internal Marks	Hours/ Course	External Marks	
Principle/Core Courses: MTHP-1,2	2	5	10	10	70	3	180	250
Elective Opt. Disciplinary: MTHE-1	1	4	4	4	30	3	70	100
Choice Base Theory: MCB-1	1	2	2	2	15	2	35	50
Soft Skill Elective Theory: SSB-1	1	2	2	2	0	2	50	50
Soft Skill based Practical: SSB-2	1	2	Minimum:4	2	0	2	50	50
Total	6		22	20	115		385	500
SEMESTER-II								
Principle/Core : MTHP-3,4	2	5	10	10	70	3	180	250
Elective Opt. Disciplinary: MTHE-2	1	4	4	4	30	3	70	100
Choice Base Theory: MCB-2	1	2	2	2	15	2	35	50
Soft Skill Elective Theory: SSB-3	1	2	2	2	0	2	50	50
Soft Skill based Practical: SSB-4	1	2	Minimum:4	2	0	2	50	50
Total	6		22	20	115		385	500
SEMESTER-III								
Principle/Core : MTHP-5,6	2	5	10	10	70	3	180	250
Elective Opt. Disciplinary:MTHE-3,4	2	4	8	8	60	3	140	200
Choice Base Theory: MCB-3 (Research Methodology)	1	2	2	2	15	2	35	50
Total	5		20	20	145		355	500
SEMESTER-IV								
Principle/Core :MTHP-7,8	2	5	10	10	70	3	180	250
AND EITHER								
Cognitive Skill-Project: MTHW	1	10	Minimu:16	10	75	1/studt	175	250
OR								

Elective Opt. Disciplinary: MTHE-5,6	2	4	10	10	10	60	3	140	200
Choice Base Theory: MCB-4	1	2		2	2	15	2	35	50
Total	3 or 5			26*	20	145		355	500
Total	20			90*	80	520		1480	2000

N.B. *Work-load depends on the number of students and the number of Batches/Groups , for practical and Cognitive-skill based Course.*

(8) ASSESSMENT AND EXAMINATION METHOD :

A candidate's understanding of principles and concepts will be assessed through CIA and UE pattern as follow:

- **CONTINUOUS INTERNAL ASSESSMENT (CIA):**

The CIA is done by the course teachers and this will be evaluated any five/six from the following NINE academic components having equal weightage.

1. Assignments, Quiz (announced or unannounced)
2. Individual viva or group viva
3. Short duration objective types tests/snap tests
4. Short answer/problem solving(15 to 30 minutes for assessment of cognitive ability)
5. Seminar (once in a semester is compulsory)
6. Unit test (written or oral)/internal test
7. Laboratory/field/practical work
8. Group Discussion(Once in a semester to assess originality, creativity, initiative, communication skills ...etc)
9. Class-room attendance/punctuality/sincerity

- **University Examination (UE):**

There shall be four semester examinations, one at the end of each semester in each academic year. A candidate who does not pass the examination in any course(s) in a semester will be permitted to appear in such failed course(s) also, with subsequent semester examinations: University Examination (UE) only.

There is no Continuous Internal Assessment for any SSB Theory/practical. Also External University Examination for SSB Theory/practical is of 50 Marks/practical (Practical including Viva :Examination- 40 marks + Record/journal book: 10 marks)

(9) REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER:

(i) Candidates shall register their name for the First Semester Examination after the admission in the M.Sc. Maths.

(ii) Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects, in consultation with the Head of The Department and available faculties.

(iii) Candidates shall be eligible to go to subsequent semester, only if he/she earns sufficient attendance as prescribed thereof by the University from time to time. In the case of candidate earning less than the prescribed attendance in any one of the semesters due to any extraordinary circumstance, shall be permitted to proceed to the next semester and such candidate shall have to repeat the missed semester by

rejoining after completion of final semester of the course, after paying the higher-fee for the break of study as prescribed by the University from time to time.

(10) PASSING MINIMUM:

A candidate shall be declared to have successfully cleared in each course / Practical / Project, if he/she secures not less than 40 % of marks [in each of the continuous internal assessment (CIA) and the University examinations (External)], provided a minimum of 40% of marks secured in the University theory examination and a minimum of 40% marks in a Practical / Project / Viva-voce.

(11) GRADING SYSTEM and CLASSIFICATION OF SUCCESSFUL CANDIDATES:

The term grading system indicates a Ten (10) Point Scale of evaluation of the performances of students in terms of marks obtained in the CIA and External Examination, grade points and letter grade.

Procedure of awarding the grades : Marks and Award of Grades:

The following TABLE-I gives the marks, numerically grades, letter grades and classification to indicate the performance of the candidate.

Table 1 : Conversion of Marks to Numerical Grade and Letter Grade (Course Performance)

Sr no.	Letter Grade	Numerical Grade	Grade Points	Performance
1	O	90 - 100	9.0 to 10.0	Out standing
2	A	80 – 89	8.0 to 8.9	Excellent
3	B	70 - 79	7.0 to 7.9	Distinction
4	C	60 - 69	6.0 to 6.9	Very Good
5	D	50 – 59	5.0 to 5.9	Good
6	E	40 - 49	4.0 to 4.9	Satisfactory
7	F	0 – 39	Below 4.0	Unsatisfactory / Fail
8	AAA	--	0.00	Absent

The result of successful candidates at the end of each semester shall be declared in terms of GRADE POINT AVERAGE (GPA) and letter grade. The result at the end of fourth semester shall be classified on the basis of the Cumulative Grade Point Average (CGPA) obtained in all the four semester and the corresponding overall letter sign grade. The TEN point grading system with the Numerical as well as the letter grade as described as above and shall be recommended to be adopted. The Grade Point Average (GPA) and the Cumulative Grade Point Average (CGPA) at the end of fourth semester shall be computed as follows.

Computation of Grade Point Average(GPA):

The letter grade is assigned a numerical grade value according to the Grading Systems- as shown in the Table 1. Each letter grade has a numeric grade point value assigned which is used to calculate Grade Point Average (GPA) and cumulative grade point average (CGPA).

The numerical grade in a course shall be assigned on the basis of actual marks scored at the semester end examination including Internal Assessment in that course as per the above Table 1 provided he/she secures

a minimum of 40% marks in the semester examination. The candidate securing less than 40% of marks in the end of semester examination (including Internal marks) in any course (may be a theory / practical / project work /dissertation ,etc.) shall be declared to have failed OR to be re-appear in the next exam in that course.

The Grade Point (GP) for each course shall then be calculated as the product of the Numerical Grade earned in that course and the credits for that course. The Grade Point Average (GPA) for each semester is obtained by adding the GP of all the courses of the semester dividing by total Credits of the semester (in science faculty it is 20 credits for each semester).

Procedure for GPA calculation: If C_i = Credits of the i^{th} course, G_i = the numerical Grade obtained for the i^{th} course and n = the number of courses (credited) offered in the semester, then the Grade Point (GP_i) for the i^{th} course of the semester is calculate as : GRADE POINT (GP_i) = $G_i \times C_i$

$$\begin{aligned} \text{GRADE POINT AVERAGE [GPA]} &= (GP_1 + GP_2 + \dots + GP_n) / (C_1 + C_2 + \dots + C_n) \\ &= (GP_1 + GP_2 + \dots + GP_n) / 20 \quad (\text{since total credit for each semester}=20) \\ &= (C_1 \times G_1 + C_2 \times G_2 + \dots + C_n \times G_n) / (C_1 + C_2 + \dots + C_n) \end{aligned}$$

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

Note: The candidates who pass the subject at first appearance and within the prescribed semester of the PG Programme (Core, Elective, Non-major Electives and Extra-Disciplinary courses alone) only shall be eligible for the evaluation process of the Grade point of that subject. Those students who clear the examination at second or subsequent attempt or having skipped the first attempt in the subject shall be granted the numerical grade of only 4.0 (as the lowest one) instead of the higher numerical grade obtained by the candidate.

Calculation of CGPA for the entire programme : Cumulative GPA is a calculation of the average of all grades for all semesters and courses completed at the PG programme.

$$\begin{aligned} \text{CUMULATIVE GRADE POINT AVERAGE [CGPA]} &= \\ &= \frac{\text{Sum of the multiplication of GPA of the semester by the total credits of that semester}}{\text{Sum of the credits of the courses of the entire programme}} \end{aligned}$$

Descriptions of each component described as follow:

Letter Grade	Numerical Grade	Grade Points	Performance	Letter Grade Description
A+	90 - 100	9.0 to 10.0	Out standing	Extra ordinary performance in the subject
A	80 – 89	8.0 to 9.0	Excellent	First Class Standing. Superior Performance showing comprehensive, in-depth understanding of subject matter. Demonstrates initiative and fluency of expression.
B+	70 - 79	7.0 to 8.0	Distinction	Basic understanding with knowledge of principles and facts at least adequate to communicate intelligently in the discipline.
B	60 - 69	6.0 to 7.0	Very Good	Clearly above average performance with knowledge of principles and facts generally complete and with no serious deficiencies.
C+	50 – 59	5.0 to 6.0	Good	Some understanding of principles and facts but with definite deficiencies.
C	40-49	4.0 to 5.0	Satisfactory	A passing grade indicating marginal performance. Student not likely to succeed in subsequent courses in the subject.
F	0 – 39	00.00	Unsatisfactory /	Knowledge of principles and facts is fragmentary;

			Fail	or student has failed to complete substantive course requirements.
AAA	--	0.00	Absent	Did not complete the course or less than 40% of course work completed.

(12). RANKING:

Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / division as shown as above. In the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations under Requirements for Proceeding to subsequent Semester are only eligible for Classification.

(13). PATTERN OF QUESTION PAPER:

Each COURSE possess four units having equal weightage . There should be five questions in a paper; each question should be from each unit and last one is of objective type from all units.

Two examiners , either both internal or one internal and one external can set the question paper. The internal examiner shall be the chairperson for the respective paper/COURSE.

(14). APPEARANCE FOR IMPROVEMENT:

Candidates who has already passed the semester-I,II&III Examination with seven optional COURSEs-MTHE-1,2,3,4& MCB-1,2,3 shall be allowed to reappear with another seven optional COURSEs (other than the previously ones) at semester-I , II & III examination to improve the result with the consent of the Head of The Department and the University. Such candidate shall have to get register for all the seven optional COURSEs in two additional terms; consecutive or alternative, and by paying the higher fees as prescribed by the university from time to time only after getting the prior permissions of the Department and the University. The result of such candidate will be declared on the basis of his/her mark sheet, in which the marks obtained by him/her in the other optional COURSEs have replaced the marks of old optional COURSEs. Such candidates are allowed to improve within a maximum period of 8 semesters counting from his/her first semester of his/her admission. If candidate improves his/her marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. No candidate will be allowed to improve marks in the Practical, Project, Viva-voce, Field work and any Core Subjects.

(15) Provisions for the Choice of Skill Based & Cognitive Work Subjects:**Faculty Advisor**

To help the students to plan their optional COURSEs of the study and to offer general advice on the academic programmes, a student will be assigned to a member of the faculty (Major Dept) who will function as "Faculty Advisor" throughout his/her period of study.

The Faculty Advisor will counsel students on matters relating to the choice of subjects, withdrawal, etc. The student will meet his/her Faculty Advisor atleast three times during the semester.

Departmental Committee

Every major department will have a Departmental Committee consisting of

- The HOD - Convener
- The Faculty Advisors of the Department

- Student representative of each class
The departmental committee is to meet at least thrice a semester to review all matters relevant to the academic programme. It is the responsibility of the faculty advisor to keep the records, Viz., the Agenda, Notes, Minutes, Diary etc.

Registration Procedure for Optional Subjects

Registration for the optional subjects should be done with the subject teacher in consultation with the HOD and Faculty Advisor. Students are expected to register for subjects intended to be credited during the next semester on specified dates.

(16). FORMAT FOR THE PREPARATION OF RECORD/PROJECT/COGNITIVE WORK:

The Rough Sketch of the Structure/Pattern provided herewith and are to be modified, time to time if needed.

(I) STRUCTURE FOR COMPUTER LABORATORY/PRACTICAL EXAMINATION.

Duration : 3 Hours Examination ,Maximum for Lab Course: 50 Marks. There is no Continuous Internal Assessment for any practical. University Exam. per practical : 50 Marks(Practical Examination: 40 marks + Journal: 10 marks)

(i) Record of Laboratory work for practical:

Title of the Course

Course Number ----- Year ----- Category ----- Semester ----- Credits ---- Course Code---Total Instructional Hours per week –

- | | |
|-----------------|---|
| (a) Aim | (b) Flowchart and Algorithm |
| (c) Source Code | (d) Input/output specification |
| (e) Printout(s) | (f) Remarks / Scope / Limitation of the Experiment. |

(ii) FORMAT FOR THE COGNITIVE/PROJECT WORK.

Title of the Course

Paper Number ----- Year ----- Category ----- Semester ----- Credits ---- Course Code-----Total Instructional Hours per week –

(a) Title page : TITLE OF THE PROJECT

A project report Submitted for the partial fulfillment for the award of the Degree of Master of Science in Mathematics by Candidate's name (Register Number)

Under the guidance of Guide's name -----

Name of the Department/College Name & Month and Year

(b) Bona fide Certificate

CERTIFICATE

*This is to certify that the report entitled “TITLE OF THE PROJECT” being submitted to the Hemchandracharya North Gujarat University of Patan by Candidate's name for the partial fulfillment for the award of the Degree of **Master of Science in Mathematics** is a bona fide record of work carried out by him/her under my guidance and supervision*

Date : Signature and Address of the Guide Signature of the HOD

Place:

Submitted for the viva-voce examination on..... at -----Examiner-1 :

.....
(Signature and Name of the External Examiner)

Chairman of the examination:..... (Signature and Name of the External Examiner)

- (c) Acknowledgement (d) Content
 (e) Introduction (f) Chapters
 (g) References (h) Appendices, if any.

(I) Principle/Core/Compulsory Courses: (MTHP-1 to 8)

All Basic/Core courses carry 5 credits in 5 hours per week teaching and in each semester any two core courses to be selected from the list of MTHP_Group with no repetitions i.e. there are total 8 following Mathematical Core Courses to be selected from semester-I to semester-IV.

(α) LIST OF COURSES FOR MTHP-GROUP (1 to 8) ANY TWO IN EACH SEMESTER

[MTHP-1]	Measure Theory	[MTHP-2]	Algebra-I
[MTHP-3]	Complex Analysis	[MTHP-4]	General Topology
[MTHP-5]	Advance Topology	[MTHP-6]	Functional Analysis-I
[MTHP-7]	Functional Analysis-II	[MTHP-8]	Field Theory

(II) ELECTIVE DISCIPLINARY COURSES: (MTHE-1 TO 4)

All elective courses carry 4 credits in 4 Hours per week teaching and there are 4 Mathematical Elective Courses to be chosen from the lists of COURSEs of not more than Two groups: three groups are Group-A, Group-B, Group-C ,

1. Group-A : Pure Mathematical Group

MTHE A-1	Differential Geometry
MTHE A-2	Techniques of Differential Equations
MTHE A-3	Number Theory
MTHE A-4	Algebraic Topology-I : Homotopy Theory
MTHE A-5	Algebraic Topology-II : Homology And Cohomology Theory
MTHE A-6	Functions of Several Variable
MTHE A-7	Differentiable Manifolds

2. Group-B : Applied Mathematical Group

MTHE B-1	Classical Mechanics-I	MTHE B-2	Classical Mechanics-II
MTHE B-3	Electrodynamics-I	MTHE B-4	Electrodynamics-II
MTHE B-5	Theory of Relativity	MTHE B-6	Relativity and Cosmology

Group – C: Applicable Mathematics Group

MTHE C-1	Mathematical Modelling
MTHE C-2	Mathematical Logic
MTHE C-3	Introduction To Artificial Intelligence
MTHE C-4	Operations Research
MTHE C-5	Advanced Operations Research
MTHE C-6	Statistical Methods
MTHE C-7	Mathematics Of Finance And Insurance PROBILITY AND STATICS
MTHE C-8	Computational Biology
MTHE C-9	Fuzzy Sets And Their Applications
MTHE C-10	BIO-MECHANICS
MTHE C-11	MATHEMATICS OF MONEY

(III) Choice Based Optional Courses: CB_Group (MCB- 1 to 3) ANY ONE

All Choice based (disciplinary as well as inter-disciplinary) courses carry 2 credits in 2 hours per week teaching and there are 3 COURSEs to be chosen from the list of CB_Group.

MCB-1	Special Functions
MCB-2	Advanced Linear Algebra
MCB-3	Research Methodology
MCB-4	Fuzzy sets, Fuzzy Logic and Fuzzy Control System
MCB-5	Integral Transforms
MCB-6	Mathematics Of Finance And Insurance
MCB-7	Industrial Mathematics

(IV) Soft Skill Based Courses : SB_Group (SSB-1 to 4) ANY TWO

All Soft-skill based courses carry 2 credits in 2 hours per week teaching and 4 hours for practical. There are total 4 Courses to be chosen from the list of SSB_Group.

SSB-1	Introduction to Computer C Language	SSB-2	Programming in C and applications (practical)
SSB-3	Introduction to Computer Graphics	SSB-4	Programming in Computer Graphics(practical)
SSB-5	Object oriented computer C++ language	SSB-6	Programming in C++ and applications (practical)
SSB-7	Introduction to MATLAB	SSB-8	Programming in MATLAB (practical)

DETAILS OF M Sc PROGRAMME

There are at least total twenty COURSEs prescribed in the following classification, to be studied to acquire M.Sc. Degree in Mathematics.

(I) Principle/Core/Compulsory Courses: (MTHP-1 to 8)

All Basic/Core courses carry 5 credits in 5 hours per week teaching and in each semester any two core courses to be selected from the list of MTHP_Group with no repetitions i.e. there are total 8 following Mathematical Core Courses to be selected from semester-I to semester-IV.

(α) LIST OF COURSES FOR MTHP-GROUP (1 to 8)

- 1 Measure Theory
- 2 Complex Analysis
- 3 General Topology
- 4 Advance Topology
- 5 Algebra-I
- 6 Field Theory
- 7 Functional Analysis-I
- 8 Functional Analysis-II

[MTHP-1] MEASURE THEORY

Revision: Standard topology on \mathbb{R} , structure of open sets, cantor set, \limsup , \liminf .

Unit-1 Algebra and σ -algebra of sets, σ -algebra of Borel sets, Lebesgue outer measure on \mathbb{R} , measurable sets, Lebesgue measure

Unit-2 Measurable function, Littelwood's three principles, Egoroff's theorem, Integral of a simple function, Lebesgue integral of bounded functions, bounded convergence theorem.

Unit-3 Integral of nonnegative functions, general Lebesgue (integral), Fatou's lemma, monotone convergence theorem, Lebesgue's convergence theorem, convergence in measure.

Unit-4 Differentiation of monotone functions, functions of bounded variation, differentiation of an integral, absolutely continuous functions and indefinite integrals.

The course is covered by "Real Analysis" by H. L. Ryoden, Macmillan Pub. Co. 3rd Ed.

Reference Books:

- (1) "Theory of Functions of a Real Variable" – by I. N. Natansen, Fredrik Pub. Co., 1964.
- (2) "Measure Theory" – by P. R. Halmos, East and West Press.
- (3) "Introduction to Real Variable Theory" – by S. C. saxena and S. N. shah Prentice Hall of India, 1980.
- (4) "Real and Complex Analysis", Rudin, W., 2nd Edition, Tata McGraw-Hill Publishing Co. Ltd., 1974.

[MTHP-2] ALGEBRA - I

Unit 1 [Revision: Group, Subgroup, Normal Subgroups, Quotient groups, Homomorphism of groups, Isomorphic groups, Permutation groups, Direct product of groups]
Cayley's theorem, Conjugacy relation on a group and its applications, Solvable groups.

Unit 2 Group actions, Sylow's theorem, Finite abelian groups, Simple groups.

Unit 3 [Revision: Ring, subrings, ring homomorphisms, ideals and quotient rings, prime and maximal ideals, Polynomial rings]

Field of fractions of an integral domain, Divisibility in rings, Euclidean ring, Principal Ideal rings.

Unit 4 Polynomial ring over a rational field, irreducibility criteria, polynomial ring over a commutative ring, Unique factorization domain.

The course is indicated by "Topics in Algebra" by I. N. Herstein, John Wiley and Sons Inc., 2nd Edition.

Reference Books:

(1) "Basic Abstract Algebra" by Bhattacharya, Jain and Nagpal, 2nd Edition.

(2) "Algebra" by S. Mcclane and G. Birkhoff, 2nd Edition,

(3) "Basic Algebra" by N. Jacobson, Hind. Pub. Corp.1984.

(4) "A first course in Abstract Algebra" by John Fraleigh (3rd Edition), Narossa Publishing House, New Delhi.

[MTHP-3] COMPLEX ANALYSIS

Unit-1 [Revision: Complex numbers and its polar and exponential forms, powers and roots]

Regions in the complex plane, continuity and differentiability of complex functions, analytic functions, Cauchy-Riemann equations, harmonic Functions of two variables, Infinite series of complex numbers, power series functions.

Unit-2 The elementary Functions: exponential, trigonometric, hyperbolic functions, logarithmic functions and its branches, rectifiable arcs. Complex line integral, complex contour integral, Cauchy's theorem for triangular contours, anti-derivatives.

Unit-3 Cauchy's integral formula, derivative of analytic functions, Morera's theorem, Liouville's theorem, Fundamental theorem of algebra, Taylor expansions, Laurent expansions.

Unit-4 Singularities, zeros of analytic functions, poles, residues, Residue Theorem, residue at poles, evaluations of improper integrals.

The course is covered by the book: Complex Variables and Applications (Fourth edition) by Ruel V Churchill and James W Brown, McGraw Hill, International Editions.

References:

1. John Duncan, The Elements of Complex Analysis, John Wiley & Sons Ltd, London. (1968)
2. L V Ahlfors, Complex Analysis, 3rd edition, McGraw Hill, International Editions, New York-1966
3. J B Conway, Functions of one complex variables, 2nd edition, Springer Verlag, New York (1973) (Indian edition: Narosa Publication House, New Delhi. (1982))
4. Serge Lang, Complex Analysis, Addison- Wesley, Publishing Co. (1997)
5. B Choudary, The Elements of Complex Analysis, 2nd edition, New Age International Ltd Publishers, New Delhi. (1992)
- 6.

[MTHP-4] GENERAL TOPOLOGY

Unit 1 Topological Spaces: Topological spaces, basis and sub-basis for a topology (definitions and examples only), The order topology, the product space $\prod X_i$ (for finitely many topological spaces X_i), subspace topology, closed sets, limit points.

Unit 2 Continuous Functions: Continuous functions, Homeomorphisms, the pasting lemma, Map into products, the metric topology, the sequence lemma, Uniform limit theorem, The quotient topology.

Unit 3 Connectedness : connected spaces, path connected spaces, connected sets in the real line, components and path-components, locally connected spaces and path connected spaces.

Unit 4 Compactness: compact spaces, compact sets in the real line, limit-point compactness, locally compact spaces, one-point compactification.

Note: All results and examples are to be excluded which use the concept of the product topology of a collection of infinitely many topological spaces.

The course is covered by “Topology – A first course” – by J. R. Munkres, Prentice – Hall of India, 1992.

Reference Books

- (1) “General Topology” – by S. Willard, Addison Wesley, 1970.
- (2) “Topology” – by J. Dugundji, Prentice – Hall of India, 1975.
- (3) “Aspects of Topology” – by C. O. Christonson and W. I. Voxman, Marcel Dekker Inc., 1977.
- (4) “General Topology” – by J. L. Kelley, D. Van Nostraml, 1950.

[MTHP-5] ADVANCED TOPOLOGY

Unit 1 Countability Axioms: First countable space, second countable space, separable space, Lindeloff space

Unit 2 Separation axioms- Hausdorff space, regular space, normal space, Urysohn’s lemma, Completely regular space, Tietze extension theorem.

Unit 3 Imbedding of Manifolds, Partition of unity, Tychonoff theorem (statement only), The Stone-cech Compactifications and uniqueness.

Unit 4 Complete metric space, Compactness in metric spaces, Ascoli’s theorem, Bair spaces, Baire category theorem.

Note: All results and examples are to be excluded which use the concept of the product topology of a collection of infinitely many topological spaces.

The course is covered by “Topology – A first course” – by J. R. Munkres, Prentice Hall of India, 1992.

Reference Books

- (1) “General Topology” – by S. Willard, Addison Wesley, 1970.
- (2) “Topology” – by J. Dugundji, Prentice – Hall of India, 1975.
- (3) “Aspects of Topology” – by C. O. Christonson and W. I. Voxman, Marcel Dekker Inc., 1977.
- (4) “General Topology” – by J. L. Kelley, D. Van Nostraml, 1950.
- (5)

[MTHP-6] FUNCTIONAL ANALYSIS-I

Unit 1 Normed linear space: definition and examples, continuous linear transformations, spaces $BL(X,Y)$, $BL(X)$ and $BL(X,X)$, l^p & L^p (for $0 \leq p \leq \aleph$) Banach spaces.

Unit 2 Hahn-Banach theorem and its applications, open mapping theorem, Dual normed spaces, natural imbedding of normed space into double dual space of normed spaces.

Unit 3 Closed graph theorem, uniform boundedness principle, conjugate of an operator, bounded inverse mapping theorem.

Unit 4 Hilbert space: definition and examples, orthogonal complement, orthonormal set, Bessel’s inequality, Projection theorem, Riesz Representation theorem.

Note: The course is roughly covered by the following books:

1. G. F. Simmons: Introduction to Topology and Modern Analysis, Tata McGraw, 1963

2. B. V. Limaye: Functional Analysis, 2nd Edition, New Age International Ltd. Publishers.

Reference Books:

- (1). S. K. Berberain: Lectures in Functional Analysis and Operator theory, Springer Verlag.
- (2). Goffman and George Padre: First course in Functional Analysis, Prentice Hall of India.
- (3). Martin Schechter: Principles of Functional Analysis (student edition) Academic Press, N York.

[MTHP-7] FUNCTIONAL ANALYSIS-II

- Unit 1** Dual and transpose of a Hilbert spaces, adjoint of an operator, self-adjoint, normal, unitary operators, projections.
- Unit 2** Finite dimensional spectral theorem, Weak and weak* convergence..
- Unit 3** Banach algebra: definition and examples, regular and singular elements , topological divisors of zero, spectral of an element and spectral radius, radical and simplicity..
- Unit 4** Gelfand mapping, applications of the formula of the spectral radius, involutions in Banach algebra, Ideals in $C(X)$, Banach-Stone theorem, Commutative C^* -algebras, Stone-Weierstras theorem, Gelfand-Naimark theorem for commutative C^* -algebra.

Note: The course is roughly covered by the following books:

- 1.G. F. Simmons:Introduction to Topology and Modern Analysis, McGraw Hill,1963.
- 2.B. V. Limaye: Functional Analysis, 2nd Edition, New Age International Limited, 2nd edition.

Reference Books:

- (1). R Larson : Banach Algebra, Marcell Dekker,1973.
- (2). H G Dales : Automatic Continuity, Cambridge, 2000
- (3). S. K. Berberain: Lectures in Functional Analysis and Operator theory, Springer Verlag.
- (4). Goffman and George Padre: First course in Functional Analysis, Prentice Hall of India.
- (5). Martin Schechter: Principles of Functional Analysis (stud. ed.) Academic Press, New York.

[MTHP-8] ALGEBRA-II (FIELD THEORY)

- Unit 1** Extensions of field, Finite, algebraic and simple field extensions, algebraic and transcendental numbers.
- Unit 2** Roots of polynomials, the splitting field of a polynomial over a field, construction with straightedge and compass.
- Unit 3** The fixed field of a group of automorphisms, the theorem on symmetric polynomials, normal field extension, the Galois group of a polynomial.
- Unit 4** The fundamental theorem of Galois theory, solvability by radicals, Galois group over the rationals, finite fields,

Note: The topics are roughly covered by chapter 5 (all articles) and chapter 7 (7.1 and 7.2 only) of the book, entitled “Topics in Algebra” by I. N. Herstein 2nd Edition. Wiley Eastern Ltd., 1975.

Reference Books:

1. “Basic Algebra” by Jacobson Vol. I & II Hindustan Publishing Co., 1984.
2. “Basic Abstract Algebra” by P B Bhattacharya, S K Jain, S R Nagpaul, 2nd Edition, Cambridge University Press, 1995.
3. “Algebra”, by Lang S, Addison – Wesley, Reading, Mass, 1965.
4. “Algebra”, by Artin M, Prentice Hall, Englewood Cliffs N J, 1991.
5. “Abstract Algebra” by David S. Dummit and Richard M – Foote, Prentice Hall, Englewood.
6. “University Algebra” by Vijay Krishnan.
7. “A first course in Abstract Algebra” by John Fraleigh, Nawsa Publishing 3rd Edition House.
8. A textbook of Modern Abstract Algebra” by Shantinaryan & Satpal, S. Chane & Company.

(II) ELECTIVE DISCIPLINARY COURSES: (MTHE-1 TO 4)

All elective courses carry 4 credits in 4 Hours per week teaching and there are 4 Mathematical Elective Courses to be chosen from the lists of COURSEs of not more than Two groups: three groups are Group-A, Group-B, Group-C ,

1. Group-A : Pure Mathematical Group

1. Differential Geometry
2. Techniques of Differential Equations
3. Number Theory
4. Algebraic Topology-I : Homotopy Theory
5. Algebraic Topology-II : Homology And Cohomology Theory
6. Functions of Several Variable
7. Differentiable Manifolds

(β) LIST OF COURSES FOR GROUP-A

[MTHE A-1] DIFFERENTIAL GEOMETRY

- Unit 1** Velocity vector and tangent vector field, reparametrization, curvature, the Serret – Frenet apparatus and Serret – Frenet theorem.
- Unit 2** The fundamental existence and uniqueness theorem for curves, non–unit speed curves. C^k coordinate patch, C^k coordinate transformation, tangent vectors to a simple surface, C^k surface in \mathbf{R}^3 ,
- Unit 3** Metric coefficients, The first fundamental form and arc length, normal curvature, geodesic curvature and Gauss’s formulas, second fundamental form and the Christoffel symbols,
- Unit 4** Geodesics, generalizations of the properties of the straight lines to curves on surfaces. Parallel vector fields along a curve and parallelism, the second fundamental form and the Weingarten map, principal, Gaussian, mean and normal curvatures,

Note: The course is roughly covered by the book, entitled,
“Elements of Differential Geometry” by R. S. Millman and G. D. Parker, Prentice Hall, 1977.

Reference Books:

1. “Elementary Differential Geometry” by B. O’Neill, Academic Press, 1966
2. “Introduction to Differential Geometry” by A. Goetz, Addison – Wesley, 1970.
3. “Differential Geometry of Curves and Surfaces” by M. Do Carma, Prentice Hall, 1976.
4. “Differential Geometry” by J. Stocker, New York, Inter Science, 1969.
5. “Introduction to Differentiable Manifolds and Riemannian Geometry” by W. Boothby, Academic Press, .
6. “Notes on Differential Geometry” by N. Hicks, Van Nostrand, 1965.

[MTHE A-2] TECHNIQUES OF DIFFERENTIAL EQUATIONS

- Unit 1** Simultaneous ordinary differential equations of first order and first degree, pfaffian method, total differential equations, partial differential equations of the first order.
- Unit 2** Cauchy’s Problem (Only Statement), Geometrical interpretation, linear equations, nonlinear equations,

Charpit's method, Jacobi's method.

Unit 3 Equation of second order, linear equations with constant and variable coefficients, the three canonical forms, method of separation of variables, Monge's method for $Rr + Ss + Tt = V$.

Unit 4 Laplace's Equations: Elementary solutions boundary value problems, separation of variables, solution with axial symmetry, the two dimensional equation. Wave Equations: One dimensional equation, three dimensional problems, general solutions of Kirchoff, diffusion equation, boundary value problems, elementary solutions, separation of variables.

The Syllabus is roughly covered by:

I. N. Snedden "Elements of Partial Differential Equations" (McGraw – Hill). Chapter – 1 (Omit 4, 7, 8), Chapter – 2 (Omit 8) Chapter – 3 (Omit 6, 7, 10), Chapter – 4 (Omit 7,8,9,10,13), Chapter – 5 (Omit 3,4,7,8,9,10), Chapter – 6 (Omit 5,6,7).

Reference Books

1. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand & Co.
2. Gerald B Folland, Introduction to Partial Differential Equations, 2nd edition, Prentice-Hall of India.(2001)

[MTHE A-3] NUMBER THEORY

Unit 1 Divisibility, G.C.D., Primes, the fundamental theorem of arithmetic, the Euclidean algorithm, The greatest integer function, the Mobius function μ , the Euler function ϕ , the divisor functions σ_k for $k \geq 0$ integer, properties of these functions, multiplicative functions, Mobius inversion formula.

Unit 2 Congruence, complete residue systems, Linear Congruence, reduced residue systems, Euler–Fermat theorem, the Chinese remainder theorem, The exponents of a number mod m , primitive roots.

Unit 3 Quadratic residues, Legendre Symbol and its properties, Gauss' Lemma, the quadratic reciprocity law, the Jacobi Symbol.

Unit 4 Diophantine Equations $ax + by = c$ and its positive solutions, the equation $X^2 + Y^2 = Z^2$, the equation $X^4 + Y^4 = Z^2$ and the equation $X^4 + Y^4 = Z^4$, sum of squares, the Fermat's Last theorem.

Note: The course is roughly covered by the book, entitled "Elementary Number Theory", 2nd edition, by David M. Burton (Wm. C. Brown Publishers, 1989).

Reference Books:

1. I. Niven and H. Zuckerman "An introduction to the theory of Numbers" 3rd edition, Wiley Eastern University Edition, New Delhi, 1985.
2. T. M. Apostol, "Introduction to Analytic Number Theorem", Springer studt edition, 1995.
3. Baker Alan, "A concise Introduction to the theory of Numbers", Cambridge, University, press, 1984.
4. Rose H. E., "A course in number theory", Oxford University Press, 1988.
5. Shapiro, Harold, "Introduction to the theory of Numbers", John Wiley and Sons, 1983.
6. Hardy, G. H. and E. M. Wright "An Introduction to the theory of Numbers", 5th edition, Oxford University Press, 1975.
7. T. Nagell "Introduction to Number Theory", 2nd edition, chelsea, 1984. **[MTHE A-4]**

ALGEBRAIC TOPOLOGY-I : HOMOTOPY THEORY

Unit I Homotopy theory: Homotopy of paths and loops, Product of two loops, Fundamental group, homomorphism induced by homotopy, retraction.

Unit II Covering spaces, The fundamental groups of the circle, Lifting of a path, Path lifting theorem, Lifting correspondence, generator and order, Retractions and fixed points, no retraction theorem, Brouwer fixed-point theorem.

Unit III The fundamental theorem of algebra, The Borsuk-Ulam theorem, Deformation retracts and homotopy type, first fundamental group of doubly punctured plane and theta-space, homotopy equivalence, the fundamental group of the punctured plane, the n-sphere S^n .

Unit IV Fundamental group of some surfaces: figure eight, torus and double torus, projective plane, The Jordan Separation Theorem and Nulhomotopy lemma for S^2 .

Note: The course of unit-I to IV is roughly covered by the book, entitled: “Topology” by James R Munkres, second edition-Pearson education, 2004.

Reference Books:

1. Elements of Algebraic Topology” by James R. Munkres Addison – Wesley Pub. Co., 1984.
2. “Basic Concepts of Algebraic Topology” by Fred H. Croom Springer, Verlag, 1978.
3. “Algebraic Topology: An Introduction” by W. S. Massey Springer Verlag, 1977.
4. “Homology Theory” by S. T. Hu, Holden–Day, Inc. San Francisco, 1966.
5. Algebraic Topology” by C. R. F. Maunder Van Nostrand Reinhold Co., 1970.
6. “Algebraic Topology” by E.H. Spanier, McGraw – Hill Book Co., 1966.
7. “Aspects of Topology” by Charles O. Christenson and William L. Voxman, Marcel Dekker Inc.,
8. “Algebraic Topology: An Introduction” by W. S. Massey Harcourt Brace Jovanovich, 1967.
9. “Algebraic Topology” by E. H. Spanier, McGraw-Hill Book Co. 1966.

[MTHE A-5] ALGEBRAIC TOPOLOGY-II : HOMOLOGY AND COHOMOLOGY THEORY

Unit 1 Simplicial Homology Groups: Geometric complexes and polyhedra, orientation of complexes, Homology, groups, The structure of Homology groups.

Unit II The Euler–Poincare theorem, the computability of homology groups, pseudomanifolds and the Homology groups of S^n .

Unit III Simplicial Approximation and the Topological Invariance of the Homology Groups: Simplicial approximation, Barycentric subdivision, Simplicial approximation theorem, Induced homomorphisms on the homology groups.

Unit IV Topological invariance of the homology groups, the Brouwer fixed–point theorem and the related results, Developments in the Cohomology Theory: The Lefschitz fixed–point theorem, Relative homology and Exact homology.

Note: The course is roughly covered by the book, entitled. “Elements of Algebraic Topology” by James R. Munkres Addison – Wesley Publishing Co., 1984.

Reference Books:

1. “Basic Concepts of Algebraic Topology” by Fred H. Croom , Springer Verlag, 1978.
2. “Algebraic Topology: An Introduction” by W. S. Massey Springer Verlag, 1977.
3. “Homology Theory” by S. T. Hu, Holden–Day, Inc. San Francisco, 1966.
4. “Algebraic Topology” by C. R. F. Maunder Van Nostrand Reinhold Co., 1970.
5. “Algebraic Topology” by E.H. Spanier, McGraw – Hill Book Co., 1966.

[MTHE A-6] FUNCTIONS OF SEVERAL VARIABLES

Unit 1 Mappings and their Differentials: Continuous mapping, definition of a differential, differentiability implies continuity, special cases, functions of class **C**, mapping of Class **C**, compositions of differentiable mappings, higher differentials.

Unit 2 Mapping into the Reals: Taylor’s theorem for one variable and for n -variables, absolute maxima and minima, location of maxima and minima.

Unit 3 Volume of a set, integral on a closed interval, condition for integrability, integral on an open set, iterated integral, volume of n -ball, interchange of order of integration with differentiation.

Unit 4 **Main theorems on Mappings:** Regular elements in $L(E,F)$, inverse of a mapping, implicit function theorem, determinant, oriented volume, change of variables in integration, length and area.

Note: The course is covered by “Calculus of Several Variables” - by Casper Goffman, Jointly Pub: Harper & Row, New York and John Weatherhill, Inc., Tokyo, 1965.

Reference Books:

- (1) “Calculus on Manifolds” – by M. Spivak.
- (2) “Functions of Several Variables” – by W. H. Fleming, Addison Wesley Pub. Co.
- (3) “Advanced Calculus” – by H. K. Nikerson, D. C. Spencer and N. E. Steenrod, Affiliated East and West Pvt. Ltd., New Delhi.
- (4) “Calculus of Several Variables” – by S. Lang.

[MTHE A-7] DIFFERENTIABLE MANIFOLDS

Unit 1 Introduction to Manifolds: Topological manifolds, Cutting and Pasting, Abstract Manifolds and examples. **Functions of Several Variables and mappings:** Differentiability for functions of several variables.

Unit 2 Differentiability of mapping and Jacobians, The space of tangent vectors at a point of \mathbf{R}^n , another definition of $T_n(\mathbf{R}^n)$, Vector fields on open subsets of \mathbf{R}^n .

Unit 3 The inverse function theorem. The rank of a mapping, Differentiable manifolds and submanifolds: Differentiable manifolds and examples, Differentiable functions and mappings.

Unit 4 Rank of a mapping, Immersions, Submanifolds, Lie Groups, the action of a lie group on a manifold.

Note: The syllabus is roughly indicated by “An Introduction to Differentiable Manifolds and Riemannian Geometry” William, M. Boothby, Academic press Chap. 1 to 3.

Reference Books:

1. “Introductions to Differentiable Manifolds” – Serge Lang, Interscience publishers.
2. “Differentiable Manifolds” – Matsushima, Marcel Dekker, Inc.
3. “Calculus on Manifolds” – M. Spivak, Benjamin.
4. “Differentiable Manifolds” – S. T. Hu. Holt, Rienhart and Winston, Inc.

2. Group-B : Applied Mathematical Group

1. Classical Mechanics-I
2. Classical Mechanics-II
3. Electrodynamics-I
4. Electrodynamics-II
5. Theory of Relativity
6. Relativity and Cosmology

(y) LIST OF COURSES FOR GROUP-B

[MTHE B-1] CLASSICAL MECHANICS-I

- Unit I** Generalized co-ordinates, holonomic, non-holonomic, rheonomous and scleronomous constraints, derivation of Lagrange's equations from D'Alembert's principle.
- Unit II** Velocity dependent potentials (electromagnetic case to be omitted); Rayleigh's dissipation function and applications, Hamilton's principle and derivation of Lagrange's equations from Hamilton's principle.
- Unit III** Extensions of Hamilton's principle to non-conservative and non-holonomic dynamical systems.
- Unit IV** Cyclic coordinates and Routh's properties, applications of Lagrange's formalism to two-body problem.
- Note:** The course is roughly covered by the book "Classical Mechanics" by H. Goldstein (2nd Edition), Narosa Publishing House, 1985.

Reference Books:

1. H. C. Corhen and P. Stechle: "Classical Mechanics", Wiley, New York, 1950.
2. J. B. Griffith: "The theory of Classical Dynamics", Cambridge Uni., Press, 1985.
3. L. D. Landan and E. M. Lifshitz: "Mechanics", Pergamon Press, 1969.

[MTHE B-2] CLASSICAL MECHANICS-II

- Unit I** Derivation of Hamilton's canonical equations of motion from both differential and integral principles; canonical transformations and the four types of generating functions.
- Unit II** Poisson's brackets as canonical invariants, Hamilton's canonical equations in Poisson bracket notation and conservation theorems, the Hamilton's – Jacobi equation and its solution.
- Unit III** The number of independent coordinates of a rigid body; Eulerian angles, rate of change of a vector and Coriolis force. angular momentum and kinetic energy of a body about a point.
- Unit IV** inertia tensor and the moment of inertia, Euler's equations of motion for rigid body and their solution for torque free motion; motion of a heavy symmetrical top with one point fixed.
- Note:** The course is roughly covered by the book "Classical Mechanics" by H. Goldstein (2nd Edition), Narosa Publishing House, 1985.

Reference Books:

- 1 H. C. Corhen and P. Stechle: "Classical Mechanics", Wiley, New York, 1950.
- 2 J. B. Griffith: "The theory of Classical Dynamics", Cambridge Uni., Press, 1985.
- 3 L. D. Landan and E. M. Lifshitz: "Mechanics", Pergamon Press, 1969.

[MTHE B-3] ELECTRODYNAMICS-I

Unit I	Introduction to Electrostatics: Coulomb's Law, Gauss's Law, equations of electrostatics.
Unit II	Green's theorem, electrostatic potential energy and energy density.
Unit III	Boundary Value Problems in Electrostatics: Method of images, some illustrations of the method of images, boundary value problems with azimuthal symmetry.
Unit IV	Electrostatics of Macroscopic Media, Dielectrics: Elementary treatment of electrostatics with ponderable media, boundary value problems with dielectrics, electrostatic energy in dielectric media.
Note:	The course is roughly covered by "Classical Electrodynamics" by J. D. Jackson, Wiley Eastern Ltd., 2 nd Edition, 1978.

Reference Books:

- (1) "Introduction to Electrodynamics" by David J. Griffith, Prentice Hall of India, 2nd Edition.
- (2) "Classical Electrodynamics" by Wajedmiah

[MTHE B-4] ELECTRODYNAMICS-II

Unit I	Magnetostatics: Biot and Savart Law, differential equations of magnetostatics. Ampere's law, magnetic fields, magnetic moment, macroscopic equations, boundary value problems in magnetostatics, time-varying fields, Maxwell's equations.
Unit II	Faraday's law, energy in magnetic field, displacement current and Maxwell's equations, vector and scalar potentials, equations of macroscopic electromagnetism, Poynting theorem.
Unit III	Special Theory of Relativity and Electromagnetic Fields: Einstein's two postulates, Lorentz transformations and basic kinematic results of special relativity, four-velocity, mathematical properties of space – time of special relativity.
UNIT IV	Transformations of electromagnetic fields, the question of obtaining the magnetic field, magnetic force and Maxwell's equations from Coulomb's law and Special Relativity, Lagrangian for electromagnetic field, canonical and symmetric stress tensors and conservation laws, solution of the wave equation in covariant form.
Note:	The course is roughly covered by of the book, entitled, "Classical Electrodynamics" by J. D. Jackson, Wiley Eastern Ltd., 2 nd Edition, 1978.

Reference Books:

- (1) "Introduction to Electrodynamics" by David J. Griffith, Prentice Hall of India, 2nd Edition.
- (2) "Classical Electrodynamics" by Wajedmiah

[MTHE B-5] THEORY OF RELATIVITY

Unit 1	Space – Time Curvature: Geodesics, geodesic deviation, parallel transport along an extended curve, curvature tensor, the Ricci tensor, scalar curvature and Einstein tensor.
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- Unit II Space – Time symmetries, displacement of space–time, some properties of killing vectors, homogeneity and isotropy space – time of constant curvature, symmetric subspaces.
- Unit III Energy Momentum Tensors, the action principle, the electromagnetic theory, Energy momentum tensors (general), conservation laws.
- Unit IV Einstein Equations of Gravitation: Accelerated observers in Minkowski space–time, Einstein’s equations: a heuristic derivation, Einstein’s equations from an action principle, the Newtonian approximation, the principle of equivalence, gravitational waves.
- Note:** The course is roughly covered by the book, entitled “Lectures on General Relativity and Cosmology” by J. V. Narlikar, The Macmillan Company of India, N.Delhi, 1978.

Reference Books:

1. “A Papapetron Lectures on General Relativity”, D. Reidel, Dordrecht, The Netherlands, 1974.
2. R. Alder, M – Bazine and M. Schiffer, “Introduction to General Relativity”, McGraw Hill – Kogakusha, Tokyo, 1975.

[MTHE B-6] RELATIVITY AND COSMOLOGY

- Unit I The Schwarzschild Solution: The spherically symmetric space–time, field equations, the Schwarzschild solution, particle orbits in Schwarzschild space–time, photon orbits.
- Unit II Experimental Tests of General Relativity, the gravitational red–shift, planetary motion, the bending of light, the Radar echodelay.
Strong Gravitational Fields (I): Equilibrium of massive spherical objects, binding energy, gravitational Collapse of a dust ball.
- Unit III Strong Gravitational Fields (II): The external Schwarzschild solution, The Kruskal – Szekers diagram, The Kerz – Newman solution.
- Unit IV The Friedmean Models: The cosmological field equations, the dust models, Radiation models, cosmologies with a non–zero Λ .
Cosmology: The observational background the cosmological postulates, observable parameters in Robertson–Walker models.
- Note:** The course is roughly covered by the book, entitled “Lectures on General Relativity and Cosmology” by J. V. Narlikar, The Macmillan Company of India, N Delhi, 1978.

Reference Books:

- 1 “A Papapetron Lectures on General Relativity”, D. Reidel, Dordrecht, The Netherlands, 1974.
- 2 R. Alder, M – Bazine and M. Schiffer, “Introduction to General Relativity”, McGraw Hill – Kogakusha, Tokyo, 1975.

3. Group – C: Applicable Mathematics Group

1. Mathematical Modelling
2. Mathematical Logic
3. Introduction To Artificial Intelligence
4. Operations Research
5. Advanced Operations Research
6. Statistical Methods

- 7. Mathematics Of Finance And Insurance
- 8. Computational Biology
- 9. Fuzzy Sets And Their Applications
- 10. BIO-MECHANICS
- 11. MATHEMATICS OF MONEY

(8) LIST OF COURSES FOR GROUP-C

[MTHE C-1] MATHEMATICAL MODELLING

- Unit 1 Introduction to the subject, its scope and limitation, classification of models. Dimensional Homogeneity, Technique of dimensional analysis, an arithmetic model of Gravity, Simple population growth model, Logistic population growth model, Geometric interpretation of logistic growth function.
- Unit 2 Two Species Population Models: Prey–Predator models for population dynamics, Geometric interpretation and stability of Prey-Predator model, competition model, Epidemic Models, Simple deterministic model, SIS Model, Epidemic Models with constant number of carriers, Epidemic model with removal.
- Unit 3 Diffusion and Glucose in the Blood stream, Model for diabetes Mellitus, Genetics Models: Hardy-Weinberg law model for genetics, Genetics model for Blood groups.
- Unit 4 Traffic Models: Macroscopic Highway traffic model, continuum hypotheses and the fundamental diagram, linear-car-following models.

Note: The course is roughly covered by the following two books:

1. J. N. Kapur, *Mathematical Modeling*, Wiley Eastern Ltd., 1988.
2. J. N. Kapur, *Mathematical Models in Biology and Medicine*, East–West press Pvt. Ltd., 1992.

Reference Books:

1. Braum, Colemem & Drew, *Differential Equation Models*, Springer–Verlag, 1983.
2. Martin Braun, *Differential Equation and their applications*, Springer-Verlag, 1977.
3. Dym & Ivey, *Principles of Mathematics Modeling*, , Academic press – 1980.
4. Lucas & Roberts, *Discrete and system models*, Springer Verlag, 1983.
5. Haberman, *Mathematical Model*, Prentice–Hall Inc., 1977.

[MTHE C-2] MATHEMATICAL LOGIC

Unit 1 PROPOSITIONAL LOGIC: Syntax: Atomic formulae; logical connectives: \neg and \vee ; formulae; defined logical connectives: \wedge , \Rightarrow , \Leftrightarrow . Semantics: Truth valuation as a map v from the set of all atomic formulae into $\{T, F\}$, Extension of v to the set of all formulae, Truth table, Tautological consequences and Tautologies. Axioms and Rules of Inferences: Propositional Axioms; Extension, Contraction, Associative and cut rules; The notion of a proof and of a theorem of Propositional Logic. Tautological Equivalence and Conjunctive Normal Form of A Formula: Algorithm to find a conjunctive normal form of a formula. Post's Tautology Theorem (Completeness of Propositional Logic).

Unit 2 FIRST ORDER LOGIC: Syntax: Variables, propositional connectives: \neg and \vee , Quantifier \exists , Equality symbol $=$; Non-logical constant, function and predicate symbols; defined connective: \forall ; Terms, Atomic formulae, formulae, subformulae of a formula, bound and free occurrence of a variable in a formula, closed formula, substitutability. Semantics: Structure of a first order language, The notion of truth of a formula in a structure (via name of each element of the universe). Axioms and Rules of Inferences: Logical axioms—propositional identity, equality and substitution axioms; Rules of inferences—Expansion, contraction, associative, cut and \exists -introduction rules; Non-logical axioms; Notion of a first order theory + some examples of first order theories. Models: The notion of a proof and theorem of first order theory, Model of a first order theories; validity (or soundness) Theorem.

Unit 3 THEOREMS IN FIRST ORDER THEORIES: autology Theorem for First Order Theories: [and few simple applications, Induction on theorems]. Results on Quantifiers: \forall -introduction rule, Generalization and Substitution Rules, Substitution Theorem, Distribution Rule and Closure Theorem. The Deduction Theorem: Deduction Theorem and Theorem on constants. The Equivalence and Equality Theorems: Equivalence Theorem, Variant Theorem, Symmetry and Equality Theorems. The Prenex Normal Form: Including the Algorithm to reduce a formula in prenex normal form.

Unit 4 THE COMPLEMENTS THEOREM:

Reduction Theorem for Consistency: Consistent theories, Reduction Theorem for consistency, conservative extension, Equivalent Theories, statement of completeness theorem. Complete Theories: Complete Theories, Henkin theories, Henkin Model of a complete Henkin theory.

Reference Books:

1. Shoenfield – “Mathematical Logic”, Addison Wesley. 2. Chang, C. L. and Lee, R. T. C. – “Symbolic Logic and Mechanical Theorem Proving”, Academic Press.

[MTC-3] INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Unit 1 PROOF OF COMPLETENESS THEOREM: Henkin Extension of a consistent theory, Lindenbaum's theorem, the proof of completeness theorem.

Extensions by Definitions and Interpretations: Proof of Completeness Theorem, Compactness Theorem

Unit 2 RECURSIVE FUNCTIONS:

Initial functions composition and minimization; Definition of recursive function, Examples of recursive function and predicates; Sequence Numbers, Godel's β -function, Closure under primitive recursion, Recursively Enumerable predicates, Characterization of recursive predicates as recursively enumerable predicate whose negation is also recursively enumerable.

Unit 3 AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE:

Resolution Method for Propositional Logic: Atoms, Literals, clauses. Resolvent of two clauses; Refutation of a set of clauses; Tree of a set of clauses, failure nodes, closed subtrees of semantic tree, Inference mode; Equivalence of unsatisfiability of a set of clauses and its refutation.

Skolemization and Herbrand Universe: Skolem normal form, Algorithm to reduce a formula in Skolem normal form; Herbrand universe and Herbrand interpretations; A set S of clauses is satisfiable iff a Herbrand interpretation of S is satisfiable; Herbrand base of a set of clauses, ground instance.

Unit 4 Herbrand theorem showing that if a set S of clause is unsatisfiable then there is a finite unsatisfiable set of ground instance of clauses of S .

The Resolution Principle for Predicate Calculus: Substitution and instances of expressions; Refutation of a set S of clauses; Resolution procedure.

The Unification Algorithm: A unifier of a set of expressions – most general unifier; the unification Algorithm; the unification theorem.

Reference Books:

1. Shoenfield – “Mathematical Logic”, Addison Wesley.
2. Change, C. L. and Lee, R. T. C. – “Symbolic Logic and Mechanical Theorem Proving”, Academic Press.

[MTHE C-4] OPERATIONS RESEARCH

- UNIT – I Development – Definition– Characteristics and Phases – Types of models – operation Research models – applications. ALLOCATION: Linear programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques - Big-M method – Duality Principle.
- UNIT – II TRANSPORTATION PROBLEM: Formulation – Optimal solution, unbalanced transportation problem – Degeneracy – Maximization case. ASSIGNMENT PROBLEM: Formulation – Optimal solution – Variants of Assignment Problem.
- UNIT – III THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – dominance principle – $m \times 2$ & $2 \times n$ games -graphical method.
- UNIT – IV PROJECT MANAGEMENT (CPM & PERT): Network concepts components– rules for network construction – critical path method (CPM) – Project evaluation and Review Techniques (PERT) PRODUCTION SCHEDULING (JOB SEQUENCING): Introduction, Johnson’s algorithm for n jobs 2 machines, Johnson’s algorithm for N jobs m machines, 2 jobs m machines using graphical method.

Books:

1. J. K. Sharma, “Operations Research – Theory and Application”, 4th Edition, Macmillan Publishers India Ltd.
2. N H Shah, Ravi Gor, Hardik Soni, “Operations Research”, PHI

[MTHE C-5] ADVANCE OPERATIONS RESEARCH (OPTIMIZATION TECHNIQUES)

- UNIT – I Introduction to optimization - Statement of an Optimization Problem - Classification of Optimization Problems - Optimization Techniques Advance topic in LPP: Introduction - Revised Simplex Method- Sensitivity or Post optimality Analysis- Karmarkar’s Interior Method-Quadratic Programming
- UNIT – II Classical Optimization Techniques - Single-Variable Optimization - Multivariable Optimization with No Constraints - Multivariable Optimization with Equality Constraints - Multivariable Optimization with Inequality Constraints
- UNIT – III INTEGER PROGRAMMING: Integer Linear Programming - Gomory’s Cutting Plane Method – Integer Nonlinear Programming - Branch-and-Bound Method - Sequential Linear Discrete Programming
- UNIT – IV DYNAMIC PROGRAMMING: Introduction - Multistage Decision Processes - Concept of Sub optimization and Principle of Optimality - Computational Procedure in Dynamic Programming – Example Illustrating the Calculus Method of Solution, the Tabular Method of Solution – Conversion of a Final Value Problem into an Initial Value Problem

Books:

1. Singiresu S. Rao, “Engineering Optimization: Theory and Practice,” 4th Edition, John Wiley & Sons, Inc.
2. Stephen Boyd and Lieven Vandenberghe, “Convex Optimization”, CAMBRIDGE UNIVERSITY PRESS

[MTHE C-6] STATISTICAL METHODS

Unit-1: Descriptive Statistics and Correlation

- Introduction to Statistics
- Applications in Business & Economics; Data: Summarizing Qualitative & Quantitative Data

- Exploratory Data Analysis: The Stem-and-leaf Display; Cross Tabulation & Scatter Diagrams
- Measures of location: Mean, Median, Mode, Percentiles, Quartiles; Measures of Variability: Range, Inter-quartile Range, Variance, Standard Deviation, Coefficient of Variation
- Measures of Distribution Shape, Relative Location and Detecting Outliers
- Measures of Association Between Two Variables; Covariance, Correlation

Unit-2: Probability & Probability Distribution

- Probability: Basic probability concepts (Experiment, sample space, events, exclusive events, exhaustive events, independent events, dependent events), methods for assigning probability (Classical method, relative frequency method, subjective method), events and their probability, addition rule (not to be proved or derived), conditional probability, multiplication rule (not to be proved or derived), Bayes' theorem (statement only, not to be proved or derived)
- Probability distribution: Random variable, Discrete and continuous random variable, expected value and variance of random variable, Probability distribution, Binomial distribution, Poisson distribution, Hypergeometric distribution, Uniform distribution, Normal distribution, Normal approximation of Binomial, exponential distribution, relationship between Poisson and Exponential distribution
- Note: Discuss pmf/pdf, properties and applications of all distribution

Unit-3: Statistical Inference

- Sampling methods, sampling distribution, central limit theorem (statement only), point and interval estimation, sampling distribution of sample mean, sampling distribution of sample proportion, Hypothesis tests: Null & alternative hypothesis, Type I & II errors, one and two tailed test, rejection rule using p-value and critical value approach, test of hypothesis about population mean (σ known, σ unknown and small sample), test of hypothesis about population proportion, Sampling distribution and test of hypothesis about difference between two population means (known and unknown σ_1 and σ_2), sampling distribution and test of hypothesis about difference between two population proportions, analysis of variance (1-way, two-way).

Unit-4: Regression

- Introduction to Regression; Simple linear Regression Model; least Square Method; Coefficient of Determination; Correlation Coefficient;
- Model Assumptions; Residual Analysis: Validating Model Assumptions; Outliers and Influential Observations
- Using the Estimated Regression Equation for Estimation & Prediction

Main Reference Book:

1. Anderson, Sweeney, Williams, "Statistics for business and economics", 9th edition, Cengage Publication
2. Glyn Davis & Branko Pecar, "Business statistics using Excel", OXFORD University press (Indian Edition).

[MTHE C-7] Probability and statistics

- Unit-I Combinatorial probability and urn models , Conditional probability, independence, Discrete and continuous sample spaces , Random variables.
- Unit-II Distributions and density functions, mean and measures, Moment generating functions - probability laws (binomial, geometric, negative binomial, hypergeometric, Poisson, uniform, exponential, gamma)
- Unit-III Standard discrete distributions uniform, binomial, Poisson, geometric, hypergeometric , Independence of random variables, joint and conditional discrete distributions , Densities: normal, exponential, gamma, Chi-square, beta, Cauchy
- Unit-IV Expectation and moments of continuous random variables , Transformation of univariate random variables, Tchebychev's inequality and weak law of large numbers , Inferential statistics, estimation of parameters by method of moments and maximum likelihood.

References:

1. Harold J. Larson: Introduction to Probability Theory and Statistical Inference. Wiley 1982.
2. V. K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics. John Wiley & Sons 1976.
3. John Freund: Introduction to Probability. Dover Publications.
4. Marylees Miller, John E. Freund, Irwin Miller: John E. Freund's Mathematical Statistics: With Applications.

Prentice Hall, 2003.

5. William Feller: Introduction to Probability Theory and Its Application (Vol 1 and vol. 2). Wiley.

6. G. R. Grimmett, David R. Stirzaker: Probability and Random Processes. Oxford University Press, 2001.

[MTHE C-8] Computational Biology

Unit -1 Basic concepts of Molecular biology, DNA and Proteins, The Central Dogma, Gene and Genome Sequences.

Unit - 2- Restriction Maps - Graphs, Interval graphs. Measuring Fragment sizes, Algorithms for double digest problem ,(DDP) - Algorithms and complexity, Approaches to DDP.

Unit 3- Integer programming, Partition Problems, Traveling Salesman Problem (TSP) simulated annealing Sequence.

Unit 4- Assembly - Sequencing strategies, Assembly in practices, fragment overlap statistics.

Text Books:-

1- Introduction to Computational Biology by M.S, Waterman Chapman & Hall, 1995.

2- Bio informatics - A practical Guide to the analysis of Genes and Proteins by A. Baxevanis and B. Ouelette, WileyInterscience (1998).

Reference Books:-

1- Introduction to Bio informatics by Attwood.

2- Bioinformatics-Sequence and Genome analysis by David W.Mount.

[MTHE C-9] FUZZY SETS AND THEIR APPLICATIONS

Unit-1: Basics of Fuzzy Theory

(1) **Fuzzy Set:** Definition of Fuzzy set and set theoretic operations, Alpha-set, Normality, Extension Principle, Triangular norms (t-norms) and triangular conorms (t-conorms).

(2) **Fuzzy numbers and fuzzy arithmetic:** Interval arithmetic, Fuzzy numbers and their representation, Arithmetic of fuzzy numbers, Special types of fuzzy numbers and their arithmetic, Ranking of fuzzy numbers

Unit-2:

(1) **Classical relation and fuzzy relation:** Crisp relations, fuzzy relations, Tolerance and equivalence relations, fuzzy tolerance and equivalence relation.

(2) **Properties of Membership Functions, Fuzzification and Defuzzification:** Features of membership functions, fuzzification, defuzzification to crisp sets, lambda-cuts for fuzzy relations, defuzzification to scalars

Unit-3: Logic and Fuzzy System

Logic: Classical logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System

(1) **Development of Membership Functions:** Membership value assignments by intuition, inference, rank ordering, inductive reasoning

(2) **Automated Methods for Fuzzy Systems:** Definitions, Batch Least squares algorithm, recursive least squares algorithm, gradient method, clustering method, learning from example, modified learning from example

(3) **Rule-base Reduction Methods:** Fuzzy system theory and Rule Reduction, Singular Value Decomposition, Combs method.

Unit-4: Fuzzy Logic Control Systems

Introduction, Control System Design, Architecture and Operation of FLC System, FLC system models, Applications of FLC systems

Main Reference Book:

1. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", Wiley India (P) Ltd.
2. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer.
3. Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Wiley & Sons.
4. C. R. Bector and S. Chandra, "Fuzzy Mathematical Programming and Fuzzy Matrix Games", Springer.

[MTHE C-10] BIO-MECHANICS

Unit 1 Bio-physics of Human Cardio - vascular system: Types of Blood Vessels, Properties of Blood, Flow in Tubes, Poiseuibles law, Erythrocyte Sedimentation Rate , Stroke's law , Palatial flow in elastic vessels.

Unit 2- Bio - physics of Human Thermo- Regulation Head Flow in Human Dermal and Subdermal parts; Derivation of Governing partial differential equations Incorporating Microcirculation and perspiration.

Unit 3- Solution of steady state and Unsteady - state flow problems in one dimesion, application of finite element method and exact solutions.

Unit 4- Diffusion processes in biology ; diffusion in Tissue Fick's principle, One, two and three Dimensional diffusion problems and their solution, Water Transport, Diffusion through membranes.

Text books:

- 1- Introduction to Mathematical Biology by S.I. Rubinow, J. Wiley & Sons.
- 2- Biomechanics by Y.C, Fung, Springer - Verlag.
- 3- Introduction to Biomathematics by V.P. Saxena, Vishwa Prakashan (Wiley eastern)

Reference Book :-

- 1- Bio-fluid Dynamics by Mazumdar.

[MTHE C-11] MATHEMATICS OF MONEY

Unit-I The Simple Interest Theorem, Consesequenceis of the theorem, Financial Digression, Ambiguities when interest period is meseared in days, Number of days calulations, The Compound Interest Theorem, Consesequenceis of the theorem, The annual effective rate, time diagram and cash flows, interest rate of return (IRR), Financial Digression, The IRR uniqueness theorem and its consequences, the rule of 72, Inflation, The purchasing power theorem, consumer price index(CPI), personal taxes, the tax theorem.

Unit-II An ordinary annuity, the future value of an ordinary annuity theorem(OAT), consequences of OAT, the interest value of an OAT and its appications, An annuity due, the future value of an annuity due theorem(ADT), the present value of an ADT, perpetuities, loans and risks, examples of loans(bond, zero coupon bond, creditcard load)

Unit-III Amortization tables, the amortization theorem, periodic payments, the periodic payment theorem(PPT), consequences of PPT, linear interpolations, credit cards payments, the credit card theorem and its appications, credit card numbers.

Unit-IV Bonds, noncallable bonds, the bond theorem, the price-yield theorem, accrued interest, duration, modified duration, convexity, portfolio, buying and selling stocks, the dollar cost averaging theorem, the long sale maintence level theorem, the short sale maintence level theorem and its examples.

Books: Course covered by the book: An Introduction to the Mathematics of Money:Savings and Investing, David,Mendel and Wright, Springer, 2000.

Reference books:

1. Investments, Bodie, Kane and Marcus, McGraw Hill, 2005, 6th ed.
2. Black-Scholes and Beyond: Option Pricing Models, McGraw Hill, 1997.
3. The Banker's Secret, Eisenson, Villard Books, New York, 1990.
4. The Handbook of Fixed Income Securities, Fabozzi and Mann, McGraw Hill, NY(2005), 7th ed.
5. Options, Futures and Other Derivatives, Hull, Prentice Hall, Upper Saddle River, New Jersey, 2006, 6th ed.
6. Interest Rate Modelling, James and Webber, John Wiley and sons, NY, 2000.
7. Investment Science, Luenberger, Oxford Uni. Press, NY, 1997.

(III) Choice Based Optional Courses: CB_Group (MCB- 1 to 3)

All Choice based(disciplinary as well as inter-disciplinary) courses carry 2 credits in 2 hours per week teaching and there are 3 COURSEs to be chosen from the list of CB_Group.

1. Special Functions
2. Advanced Linear Algebra
3. Research Methodology
4. Fuzzy sets, Fuzzy Logic and Fuzzy Control System
5. Integral Transforms
6. Mathematics Of Finance And Insurance
7. Industrial Mathematics

(μ) LIST OF COURSES FOR MCB GROUP

[MCB-1] SPECIAL FUNCTIONS

Unit 1: Power series solutions, Gauss's Hypergeometric function.

Unit 2 Hermite Polynomials., Chebyshev Polynomials.

Unit 3: Legendre Polynomials.

Unit 4: Bessel Functions.

The Syllabus is roughly indicated by George F. Simmons: "Differential equations with applications and historical notes". Tata McGraw-Hill, Publishing Co. Ltd., New Delhi, 1974.

Reference Books:

1. An Introduction to Ordinary Differential Equations – E. A. Coddington, Prentice-Hall of India Private Ltd., New Delhi, 2001 .
2. Elementary Differential Equations (3rd Edition) – W. T. Martin and E. Reissner, Addison Wesley Publishing Company, inc., 1995.
3. Theory of Ordinary Differential Equations – E. A. Coddington and N. Levinson, Tata McGraw hill Publishing co. Ltd. New Delhi, 1999.

[MCB-2] ADVANCED LINEAR ALGEBRA

Revision: Vector spaces, subspaces, bases and dimensions, dual spaces, linear transformations.

Unit-1 The algebra of linear transformations, characteristic roots, matrices.

Unit-2 Triangular canonical forms, nilpotent linear transformations.

Unit-3 Trace and transpose, a decomposition theorem, Jordan canonical forms,

Unit-4 Rational canonical forms., Determinants.

The course is roughly covered by the book entitled “Topics in Algebra”, 2nd edition, by I N Herstein, John Wiley & Sons, Student Edition, New York. (2004)

References:

1. Kenneth Hoffman, Ray Kunze, Linear Algebra, 2nd edition, Prentice Hall of India, New Delhi. (1971)
2. P.B. Bhattacharya, Phani Bhushan Bhattacharya, S. K Jain, S. R. Nagpaul, First course in linear algebra, New Age International Ltd Publishers, New Delhi. (2008)
3. Steven Roman, Advanced linear algebra, 3rd edition, Springer. (2008)

[MCB-3] RESEARCH METHODOLOGY

- Unit 1** What is research? Science and research, Basic and applied research, Essential steps in research. Characteristic of scientific research. Research and experimental design.
- Unit 2** Statistics: Definition and scope, data collection, classification, tabulation of data and its graphical and diagrammatic presentation. Measures of central tendency, dispersion and standard error, Probability, distributions, binomial, Poisson and normal distribution.
- Unit 3** Statistical significance: Hypothesis testing, types of error, level of significance, various test and Chi-square goodness of fit, Simple linear regression and correlation analysis.
- Unit 4** Scientific Writing, Research Proposal, Research Paper, Review Paper, Thesis, Conference Report, Book Review and Project Report (any two), Reference Writing, Scientific Abbreviations. Preparation and Delivery of Scientific Presentations, Research Report / Thesis Formatting and Typing (Computing), Title page, Certificate, Declaration, Acknowledgement, List of Table, Figures, Abbreviations and Symbols, Chapters Quotations, Table, Figures, Summary, Appendices, References etc.

References

- 1 How to write and publish a scientific paper by Day, R.A.
- 2 Guide to write scientific papers by Garson, G.D.
- 3 Developing Bioinformatics computer skill by Gibas.
- 4 Instrumental methods of analysis by D.A. Skoog

[MCB-4] FUZZY SETS, FUZZY LOGIC AND FUZZY CONTROL SYSTEM

Unit-1: Fuzzy Set Theory

Fuzzy versus Crisp, Crisp Sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations

Unit-2: Fuzzy Systems

Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, Applications

Unit-3: Fuzzy Logic Control Systems

Introduction, Control System Design, Architecture and Operation of FLC System

Unit-4: FLC system models, Applications of FLC systems

Main Reference Book:

1. S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, Wiley India (P) Ltd.
2. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer.
3. Timothy J Ross, “Fuzzy Logic with Engineering Applications”, John Wiley & Sons.

[MCB-5] INTEGRAL TRANSFORMS

Unit 1 Laplace transform- Definition and its properties. Rules of manipulation. Laplace transform of derivatives and integrals.

Unit 2 Properties of inverse Laplace transform. Convolution theorem. Complex inversion formula.

Unit 3 Fourier transform - Definition and properties of Fourier sine, cosine and complex transforms.

Unit 4 Convolution theorem. Inversion theorems. Fourier transform of derivatives. Mellin transform- Definition and elementary properties. Mellin transforms of derivatives and integrals. Inversion theorem. Convolution theorem.

List of books:

- The Fourier Transforms and its applications, by Ronald Bracewell
- Schaum's outline of Fourier analysis with applications to Boundary value problems, by Murray Spiegel
- The Laplace Transform: Theory and applications, by Joel L. Schiff
- Schaum's outline of Laplace Transforms, by Murray Spiegel
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[MCB-6] MATHEMATICS OF FINANCE AND INSURANCE

Unit-1	Elements of Theory of Interest
Unit-2	Flow Valuation Annuities
Unit-3	Amortization and Sinking Funds, brief review of probability theory.
Unit-4	Survival Distributions , Life Tables, Valuing Contingent Payment Life insurance,

Text Books:

- 1 Options, Futures and other Derivatives by Jhon C. Hull Prentice –Hall of India Pvt. Ltd.
- 2 An introduction to Mathematic Finance by Cheldon M. Ross, Cambridge University Press

Reference Books:

- 1 An Introduction to Mathematics of Financial Derivatives by Salih N.Neftci, Academic Press.
- 2 Mathematics of Financial markets by Ribert J. Elliot & P.E. Kopp Springer Verlag, New York.

[MCB-7] INDUSTRIAL MATHEMATICS

- Unit 1** Application to problems of industry with Partial differential equations and techniques of solution. Finite difference methods for solving PDE,
- Unit 2** Linear Programming problems. Computational procedure of Simplex method, Two-phase Simplex method, Big-M-method, Revised Simplex method, Duality in linear programming, Duality and Simplex method.
- Unit 3** Application to problems of industry with Assignment models. Mathematical formulation, Hungarian method. Travelling Salesman problem. Transportation models. Mathematical formulation. Initial basic feasible solution. Degeneracy and unbalanced transportation problems
- Unit 4** Inventory Models. EOQ models with and without shortages. EOQ models with constraints. Replacement and Reliability models.

List of Books:

1. Nonlinear Ordinary Differential Equations : An Introduction For Scientist And Engineers, Jordan D. W. , Oxford University Press
2. Textbook Of Ordinary Differential Equations, Mondal C.R., Prentice Hall Of India Pvt. Ltd.
3. Elements Of Partial Differential Equations, Sneddon I N, Tata Macgraw Hill
4. Advanced Partial Differential Equations : With Boundary Value Problems, Pundir Sudhir K., Tata Macgraw Hill
5. Partial Differential Equations, Evans Lawrence, American Mathematical Society
6. Operations Research : Methods And Applications, Sharma J. K, Macmillan Press Ltd.
7. Operations Research : Problems And Solutions, Sharma J. K, Macmillan Press Ltd.
8. Optimization Methods In Operations Research And Systems Analysis, Mittal K. V., New Age International Pvt Ltd

(IV) Soft Skill Based Courses : SB_Group (SSB-1 to 4)

All Soft-skill based courses carry 2 credits in 2 hours per week teaching and 4 hours for practical. There are total 4 Courses to be chosen from the list of SSB_Group.

- 1 Introduction to Computer C Language
- 2 Programming in C and applications (practical)
- 3 Object oriented computer C++ language
- 4 Programming in C++ and applications (practical)
- 5 Introduction to MATLAB
- 6 Programming in MATLAB (practical)
- 7 Introduction to Computer Graphics
- 8 Programming in Computer Graphics(practical)

(σ) LIST OF COURSES FOR SSB GROUP**[SSB-1] INTRODUCTION TO COMPUTER “C” LANGUAGE**

- Unit 1 Constants, variables and data types, operators and expressions, managing input and output operators
- Unit 2 Conditional statements, Decision making and branching , Decision making and looping.
- Unit 3 Defining and manipulating Arrays, Logical expression and more control statements, handling of character strings
- Unit 4 User-defined functions , Some mathematical C- programs.

The course is roughly covered by the book, entitled “Programming in ANSI C” by E. Balagurusamy, The McGraw-Hill Pub. Co. Ltd., 1992.

Reference Books:

1. Computer programming in C, V Rajaraman, PHI-2002
- 2 “The C Programming Language” by B. W. Kernighan and B. M. Ritchie. Prentice-Hall, 1977.
- 3 “The C Primer” by L. Hancock and M. Krieger, McGraw-Hill, 1987.

[SSB-2] PROGRAMMING IN ‘C’ AND APPLICATIONS (PRACTICAL)

The following programs are to be practised:

1. Largest among the numbers, Sum of individual digits of a given number
2. Reverse order of a given number, evaluations of operators,
- 3 . Determination of roots of quadratic equations, $Ax^2+Bx+C=0$,
- 4 . Arranging given set of numbers in increasing/decreasing order, calculation of Mean.
- 5 . Evaluation of sum of power series eg. e^x , $\sin x$, $\cos x$, $\log(1+x)$.
6. Calculation of GCD/LCM of two integers, sum of given numbers, Fibonacci numbers
7. Evaluation of factorial of a positive integer and evaluation of binomial coefficients.
8. Evaluation of Prime and Armstrong numbers, Generation of twin primes, automorphic numbers
9. Addition, subtraction and multiplication of matrices, Transpose, determinant...etc
- 10 Writing a given number in words using function, Arranging a set of names in alphabetical order.
11. Operations with strings and sorting.etc

Reference Books:

1. “Programming in ANSI C” by E. Balagurusamy, The McGraw-Hill Pub. Co. Ltd., 1992.
- 2 “Computer programming in C”, V Rajaraman, PHI-2002
- 3 “The C Programming Language” by B. W. Kernighan and B. M. Ritchie. Prentice-Hall, 1977.
- 4 “The C Primer” by L. Hancock and M. Krieger, McGraw-Hill, 1987.

[SSB-3] COMPUTER GRAPHICS

- Unit 1 Introduction to Computer Graphics and 2-D computer graphics-line, introduction, DBplay devices, DBplay-File interpreter, structure and algorithms, DBplay control, frame butter, normalized device coordinates.
- Unit 2 Two- Dimensional Graphics: 2-D geometry, line generation, antialiasing of lines, character generation.

- Unit 3 Polygons, transformations, segments, windowing, clipping and iteration.
Basics of Polygons, polygon filling, scaling and rotation transformations, segment creation, closing and deleting segments, concepts of window and view-port, viewing transformation, line and polygon clipping, intersection.
- Unit 4 Three dimensional graphics, 3-D geometry, primitive transformations, rotation and scaling, parallel and perspective projection, viewing parameter, clipping in three dimensions, 3-D viewing transformations.

Reference Books:

1. “Computer Graphics’ (2nd Ed.) by Steven Harington McGraw-Hill ,International Edition, 1988.
2. “Computer Graphics” by Plastock and Kelley, McGraw-Hill, 1986.

[SSB-4] PROGRAMMING IN COMPUTER GRAPHICS (PRACTICAL)

The students are expected to write and run the computer programs on the following topics:

1. Implication of line and circle algorithm
2. Modification in line algorithm to generate dashed line.
3. Character-display.
4. Polygon filling.
5. Transformation of objects.
6. Use of segments in forming pictures from given objects.
7. Zooming the portion of windows and display in view ports.
8. Line clipping and polygon clipping.
9. Displaying 3-D objects on 2-D surfaces.

Reference Books:

- 1 “Computer Graphics’ (2nd Ed.) by Steven Harington McGraw-Hill ,International Edition, 1988.
- 2 “Computer Graphics” by Plastock and Kelley, McGraw-Hill, 1986.

[SSB-5] OBJECT ORIENTED “C” LANGUAGE

- Unit 1** Array-declaration/initialization, array structure, Classes-objects, array as class members data, array of objects, string as a class members, user defined string type.
- Unit 2** Function-declaration/initialization, variables and storage classes, calling function, passing arguments (constants, variables, array , structure variables, objects) to function, passing arguments (simple data type, structure variables, objects) by reference.
- Unit 3** processing character strings, character data type, manipulating of characters, string processing , input and output of strings, enumerated data type and stacks.
- Unit 4** Structures, use of structure in arrays and arrays in structures, Pointer data type and its applications, pointers and functions , file management in C, Developing a C program.

Reference Books:

- 1 “The C Programming Language” by B. W. Kernighan and B. M. Ritchie. Prentice-Hall, 1977.
- 2 Computer programming in C, V Rajaraman, PHI-2002
- 3 “Programming in ANSI C” by E. Balagurusamy, The McGraw-Hill Pub. Co. Ltd., 1992.
- 4 “The C Primer” by L. Hancock and M. Krieger, McGraw-Hill, 1987.
- 5 Mahpatra P B, Thinking in C:Including Object Oriented Programming with C, Wheeler Pub.

[SSB-6] PROGRAMMING IN OBJECT ORIENTED “C” AND APPLICATIONS (PRACTICAL)

List of practical to be performed on computers:

1. Statistical data processing programs
2. Functions programs to calculate interest ...etc
3. Operations on Matrices, Gauss elimination method and its applications.
4. Sequences-sorting, searching and merging, program related to functions
5. Function to read a line and store in buffer , find length and so on..
6. String processing programs, programs related to enumerated data types and stacks

7. Programs related to structures , pointers and functions
8. Newton's form of polynomial, interpolation polynomial, divided difference table
9. Numerical integration, numerical solutions of differential equations.

Reference Books:

- 1 "The C Programming Language" by B. W. Kernighan and B. M. Ritchie. Prentice-Hall, 1977.
- 2 Computer programming in C, V Rajaraman, PHI-2002
- 3 "Programming in ANSI C" by E. Balagurusamy, The McGraw-Hill Pub. Co. Ltd., 1992.
- 4 "The C Primer" by L. Hancock and M. Krieger, McGraw-Hill, 1987.
- 5 Mahapatra P B, Thinking in C:Including Object Oriented Programming with C, Wheeler Pub.

[SSB-7] INTRODUCTION TO MATLAB

Unit-I & II Introduction to Matlab

1. Matlab Interface 2. Menus and the toolbar
3. Computing with Matlab 4. Script files and the Editor Debugger
5. Matlab Help System

Arrays and Matrices

1. Arrays 2. Multidimensional Arrays
3. Element by Element Operations 4. Polynomial Operations Using Arrays
5. Cell Arrays 6. Structure Arrays 7. Matrices
8. Referencing Individual Entries 9. Matrix Operations
10. Submatrices and Colon Notation

Functions & Files

1. Elementary Mathematical Functions 2. User Defined Functions
3. Advanced Function Programming 4. Working with Data Files

Unit-III & IV Programming Techniques

1. Program Design and Development 2. Relational Operators and Logical Variables
3. Logical Operators and Functions 4. Conditional Statements
5. Loops 6. The Switch Structure 7. Debugging Mat Lab Programs

Plotting

1. XY- plotting functions 2. Subplots and Overlay plots
3. Special Plot types 4. Interactive plotting
5. Function Discovery 6. 3-D plots

Polynomials

1. Roots 2. Multiplication 3. Addition 4. Division
5. Derivatives and Integrals 6. Evaluation

7. Rational Polynomials 8. Curve Fitting
Integration and Differentiation

1. Integration 2. Differentiation

Main Book :

1. Introduction to Matlab 7 for Engineers, by William J. Palm III, McGraw Hill 2005.
2. Mastering Matlab 7, by Duane Hanselman, Bruce Littlefield, Pearson Education 2005.
3. Learning Matlab-7, Oxford,2008

[SSB-8] Programming in MATLAB (Practicals)

Practical related to the followings:

1. Mat lab Environment: MATLAB user interface, commands and variables
2. Built in Mat lab Functions
3. Vector and matrix data, data types
4. Plotting
5. User Defined Functions
6. Mathematical/Engineering case studies

Main Book :

1. Introduction to Mat lab-7 for Engineers, by William J. Palm III, McGraw Hill 2005.
2. Mastering Mat lab-7, by Duane Hanselman, Bruce Littlefield, Pearson Education 2005.
3. Learning Matlab-7, Oxford,2008

(V) Cognitive Skill-Work Project : MTHW_Group (MTHW-I)

COURSE: MTHW-I Cognitive Skill-Work Project

AIM : To develop student's cognitive abilities to solve assignment/problemetc, problems in a longer time frame than in usual in other courses. Students will learn how to search for known results and techniques related the project work. On completion of the project work, each student is expected to Submit a written document describing the results, mathematical developments, background material, bibliographical search etc. Present orally in a seminar setting of the work done in the project work. The students will meet regularly with the project guide to work out problems that appear and adjust the goals and time frame accordingly. The project should be carried out individually/ jointly are acceptable only with prior permission of the Guide.

Cognitive skill-work based Project carries 10 credits in at least 16 hours depending on the number of students and the number of Batches/Groups) per week teaching and two work-Project to be chosen from the list of MTHW Group.

MTHW Group: Any TWO from the followings.

- 1 BOOK REVIEW
- 2 PROJECT WORK/FIELD WOR
- 3 PROBLEM SOLVING WORK
- 4 FOUNDATION OF MATHEMATICS
- 5 HISTORY OF MATHEMATICS
- 6 MATHEMATICS EDUCATION
- 7 MINI DISSERTATION ON SPECIAL TOPICS OF MATHEMATICAL SUBJECTS (to be suggested by the faculty)

- 8 *Any Special Topics to be selected by the faculty which may includes: supportive courses, life oriented education, personality development activities, leisure hour activityetc.*

Scheme of Evaluation :

A project/cognitive report will be the outcome of the assignment given by the faculty in the fourth semester. The project work should be an individual one. The final semester project work will be evaluated by any two examiners : The Subject teacher, The Chairman of the Examination and an external examiner (appointed by the University) .

Project Report/cognitive work : 250 Marks, Passing Minimum for the Project: 45% marks

Total 250 marks divided as :

75 marks for Internal &

175 marks of External Exam separated as

75 marks for Presentation + 100 marks for Viva-voce Examination.

N.B.: More Elective/Soft Skill based courses can be added from time to time as and when needed, subject to the availability of the faculties , GOVT./UNIVERSITY's policy matter and demand/requirement of the students.

BIO-

TECHNOLOGY

ZOOLOGY

Z 506: Dissertation/ Project work

Students, are required to undergo Project work, Original Research work or Specialized training and to prepare a detailed report as 'Master's Thesis'. Students may work in their own institute under the supervision of any faculty member or at any reputed Research Institute or Industries.

Z 507: Book Review

Along with the Masters' Thesis, students are also required to review a book of the related subject of his dissertation or the subject and prepare a review report emphasizing of all chapters and submit at the final examination.

BOTANY

CBO-504 PLANT BREEDING AND HORTICULTURE

Unit-I. Plant Breeding-I

Plant breeding – objectives, origin, domestication
Hybrid vigour Principles and methods of Plant Breeding
Self pollinated crops
Cross pollinated crops
Clonal crops Plant Introductions – NBPGR

Unit-II. Plant Breeding-II

Biosafety and Bioethics IPR, Patents, concept, benefits
GATT, TRIPS Biosafety and bioethics: objectives, risk assessment, containment
Genetically modified plants
Seed certification
Release of varieties
Plant Breeder's Right

References

- Chopra V L (2000), *Plant Breeding (2nd edition)*, Oxford & IBH Publishing P Ltd New Delhi.
Chaudhari H K (1997), *Elementary Principles of Plant Breeding (2nd edition)*, Oxford & IBH Publishing P Ltd New Delhi.
Sadhu M K (1996), *Plant Propagation* , New Age International Publishers, New Delhi.
Gupta P K (2004), *Plant Breeding, Plant Propagation and Bio technology*, Rastogi Publications, Meerut.
Singh B D (2005) *Plant Breeding, Principles and Methods*, Kalyani Publishers, Ludhiana
Gupta S K (2005), Practical Plant Breeding, Agrobios (India), Jodhpur
Vijendra Das L D (1998), *Plant Breeding*, New Age International Publishers, New Delhi.
Agrawal Ratan Lal (2002), *Fundamentals of Plant Breeding & Hybrid Seed Production*, Oxford & IBH Publishing P Ltd New Delhi.
Shukla R S and Chandel P S (2004), Cytogenetics, Evolution and Plant Breeding, S Chand & Co Ltd, New Delhi

Unit-III. Horticulture-I

Horticulture Propagation by seeds and vegetative structures, harvesting, storage and viability Germination, dormancy (seed and bud), Pretreatments Techniques
Anatomical and Physiological aspects of rooting of cuttings, Grafting, Budding, Layering Important horticultural crops of India with emphasis on Gujarat fruit/flowers, cultivation, harvest and post – harvest handling

Unit-IV. Horticulture-II

Gardening and Landscape Cultivation under cover
Greenhouse: advantages, construction, types, maintenance
Organic farming, mulching, composting
IPM, advantages
Landscaping-principles, types, planning
Xeriscaping Garden-features/elements, styles
Indoor gardening
Gardens of India

CBO-505 MYCORRHIZAE, MUSHROOMS, ETHNOBOTANY AND PLANT GEOGRAPHY

Unit-I Mycorrhizae

1. Introduction to Ectomycorrhizae, AM Fungi and orchid mycorrhizae
2. Glomeromycota - Recent trends in mycorrhizal taxonomy
3. Isolation and multiplication of mycorrhizae, role in crop productivity and forestry.
4. Phosphate solubilizing fungi (PSF)

Unit-II Mushrooms

1. Types of Mushrooms:
Oyster, white button, paddy straw, Morels, Truffles and poisonous mushrooms.
2. Method of cultivation of *Agaricus bisporus*, scope and commercial cultivation and biological significance.
3. Medicinal and nutritional value of Edible and Poisonous mushrooms.
4. Effect of environmental, nutrient and chemical factors on mushroom formation

Unit-III Ethnobotany

1. Ethnobotany and its sub disciplines, Major tribes in India, Comparison of Ethnobotany and Economic botany
2. Medico-ethnobotanical surveys and their role in Ayurveda. Following medico-ethno-botanically important plants are to be studied: *Adhatoda*, *Rauwolfia*, *Azadirachta*, *Madhuca*, Turmeric, Pipal, Tulsi, Amla, Baheda, Harde, Arjun sadad, *Diospyros*
3. Ethnobotany and its role in domestication and conservation of native plant genetic resources.
4. Ethnobotany in context of National priorities and Health care programme.

Unit-IV Plant geography

1. Importance of phytogeography
2. Continental drift
3. Climate and vegetation, discontinuity and endemism
4. Vegetation types of India, Forest types of Gujarat
5. Land flora of Gujarat

CBO-505 MYCORRHIZAE, MUSHROOMS, ETHNOBOTANY AND PLANT GEOGRAPHY

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Unit-IV Plant geography

1. Importance of phytogeography
2. Continental drift
3. Climate and vegetation, discontinuity and endemism
4. Vegetation types of India, Forest types of Gujarat
5. Land flora of Gujarat

PBO-504 PRACTICAL BASED ON TOPIC COVERED IN CBO-504

Plant Breeding - Practicals

1. Plant breeding – Methods of Plant Breeding in Self pollinated crops and Cross pollinated crops
2. An account of Clonal crops
3. Some examples of genetically modified plant crop species (locally available crops).

Horticulture - Practicals

1. To detect the Seed viability.
2. Plant Propagation by seeds and vegetative structures (tuber, rhizome, bulb, corm)
3. To study the Seed Germination in some selected plant species (Dicot & Monocot).
4. Perform the Horticultural techniques: Stem cutting, Grafting, Budding, Layering, Potting & Repotting.
5. Landscaping - principles, types and planning.
6. Greenhouse - construction and maintenance techniques.
7. To prepare - Organic farming, mulching and composting.
8. Indoor gardening - techniques and practices.

PBO-505 PRACTICAL BASED ON TOPIC COVERED IN CBO-505

Mycorrhizae

1. Isolation and identification of mycorrhizae from local crop / forest / wild plant species.

Mushrooms

1. Method of cultivation of *Agaricus bisporus* (edible mushroom), commercial cultivation and its biological significance.

Ethnobotany

1. Medico-ethnobotanical surveys at different places of India.
2. Following medico-ethnobotanical important plant species are considered with references to scientific name, local name, family, useful parts, ethnobotany, existing availability and regeneration status of the particular area: *Adhatoda*, *Rauwolfia*, *Azadirachta*, *Madhuca*, Turmeric, Pipal, Tulsi, Amla, Baheda, Harde, Arjun sadad, *Diospyros*

Plant geography

1. Climatic zones of India.
2. Vegetation types of India.
3. Forest types of Gujarat.
4. Endemic species of Gujarat.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATA N

M.Sc. Programme :: Semester - IV

Soft Skill Course in Botany

SBO-401 :: English language communication

Soft Credits: 2

Unit I

Theory of Communication: Definition & process of Communication [3*], Objectives of Communication [6-20**], Barriers to effective Communication [52 -61**]

Structure and layout of letters: Elements of structure, forms of layout, Styles of presentation [19 -33*]

Modern office technology: Computer, Fax, E-mail, Duplication Technology: Duplication, Photo copy, Printing, Storage Devices [110-117*]

Job application and how to make a resume [78-81*]

Unit-II Language Work:

1. Tenses, Preposition, Vocabulary, Confusables***
2. Comprehension or précis writing.

Reference Books:

****Essentials of Business Communication**

Publisher: S Chand & Sons

By Rajendra Pal and J S Korlahalli

Seventh Revised Edition,

Reprint 1996

***Business Correspondence and Report Writing**

Publisher: Tata Mac. Co. Ltd

By R C Sharma and Krishna Mohan

9th Reprint, 1998.

List of Confusables***

Aboard	Avoid	Cite	Dear	Emigrant
Abroad	Evade	Site	Deer	Immigrant
Accept	Bail	Coast	Defer	Fair
Except	Bale	Cost	Differ	Fare
Access	Berth	Complement	Deficit	Foreword
Excess	Birth	Compliment	Deficiency	Forward
Adapt	Beside	Confidant	Deny	Industrial
Adopt	Besides	Confident	Refuse	Industrious
Addition	Boast	Continual	Depose	Judicious
Edition	Boost	Continuous	Dispose	Judicial
Affect	Carton	Credible	Draft	Loose
Effect	Cartoon	Creditable	Draught	Lose
Alternate	Check	Damage	Eligible	
Alternative	Cheque	Damages	Illegible	

SBO-401 :: English language communication

Duration: **2 Hrs**

Total Marks: **50**

Unit-I

- | | | |
|-------|--|----------------|
| 1. a. | Theory of communication | 6 Marks |
| b. | Structure and layout of letters | 6 Marks |
| c. | Modern office technology | 6 Marks |
| d. | Job application and how to make a resume | 7 Marks |

Unit-II

- | | | |
|-------|---------------------------------|-----------------|
| 2. a. | Grammar | 15 Marks |
| b. | Comprehension or précis writing | 10 Marks |
-

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATA N

M.Sc. Programme :: Semester - IV

Soft Skill Course in Botany

SBO-402 :: Computer applications

Credits: 2

Teaching Hours per Week:2

(2 hour for theory per week)

UNIT 1 Introduction To Word – 2003

- What Is Word Processing?
- Advantages Of Word Processing.
- Starting Word-2003 And Its Parts.
- Basic Operations on A Document.
Typing, Saving, Printing, Print Preview, Opening, Closing A Document And Saving A Document With New Name.
- Editing A Document.
 - Cursor Movement, Selected Text, Deleting Text, Replacing Text, Undoing And Redoing Changes, Moving To A Specific Page
 - Move And Copy Text
- Formatting Text And Paragraph.
- Alignment, Font Dialog Box, Bullets And Numbering, Controlling Paragraph, Indents, Line Spacing, Border And Shade, Inserting Date / Time
- 1. Finding And Replacing A Text
- 2. Table
- 3. Spell Check
- 4. Auto Text & Auto Correct

UNIT 2 Introduction To Excel – 2003

- What Is An Electronic Worksheet And Its Advantage
- Starting Excel And The Excel Screen
- Entering Value, Text And Formula
- Advantages Of Using Formula
- Concepts Of Cell, Range, Worksheet And Workbook
- Saving, Closing, Opening A Workbook
- Creating A New Worksheet
- Moving And Coping Data
- Doing And Undoing Actions
- Inserting And Deleting Columns And Rows
- Formatting Worksheet
- Changing Column Width And Row Height

Advanced Excel – I

- Printing The Worksheet
- Setting Up Pages And Margins
- Defining Header And Footer
- Advanced Print Options
- Creating Charts

Excel Function

- Using Date And Time Functions
 - Today(), Now(), Day(), Month(), Year()
 - Hour(), Minute(), Second()
- Other Functions
 - Average, Count, Max, Min, Stdev, Var
 - Sum, Abs, Int, Log, Mod. Round, Sqrt, Auto Sum

Recommended Reading:

1. Fundamentals Of Computer Application Part -I And II (2012), Dr. A M Patel, Pankaj Pandya, Kiran Desai And Others, Shri Jalaram Publication.
2. IT Tools & Applications, Taxali R.K., TMH.

M.Sc. Semester-IV

April/May-2013

SBO-402 :: Computer applications

Duration: 2 Hrs

Total Marks: 50

1.	MCQs (10 out of 12) (Each of 1 Mark) [At least 4 questions from each Unit]	10
2 (A)	Medium type question (2 out of 3) (Each of 4 Mark) [only from Unit-I]	08
2. (B)	Short notes (4 out of 6) (Each of 2 Mark) [only from Unit-I]	08
2. (C)	Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-I]	04
3 (A)	Medium type question (2 out of 3) (Each of 4 Mark) [only from Unit-II]	08
3. (B)	Short notes (4 out of 6) (Each of 2 Mark) [only from Unit-II]	08
3. (C)	Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-II]	04

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATA N

M.Sc. Programme :: Semester - IV

Soft Skill Course in Botany

SBO-403 :: Personality development

Total Credit: 2
Exam duration: 2 hours

Teaching Time: 2(Hours/week)
Total (External) Marks: 50

Unit 1

- What is personality?
- Theories of Personality.
- Psychoanalytical theories.
- Trait theories, Behaviorist view, Skinner, Social learning theory, Phenomenological perspectives.

Unit 2

- Personality Development: Physical Aspects for Male and Female .
- Hygiene, Habits and Fitness.
- Communicating Skills.
- Non-verbal Communication.

Reference Books:

IGNOU study material for Personality Development.

M.Sc. Semester-IV

April/May-2013

SBO-403 :: Personality development

Duration: 2 Hrs

Total Marks: 50

- | | | |
|---------------|--|-----------|
| 1. | Short answer type questions. (10 out of 12) (Each of 1 Mark) [At least 4 questions from each Unit] | 10 |
| 2 (A) | Medium type questions (3 out of 5) (Each of 4 Mark) [only from Unit-I] | 12 |
| 2. (B) | Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-I] | 08 |
| 3 (A) | Medium type questions (3 out of 5) (Each of 4 Mark) [only from Unit-II] | 12 |
| 3. (B) | Short notes (4 out of 6) (Each of 1 Mark) [only from Unit-II] | 08 |

MICRO-
BIOLOGY

MB 401 Project Work

Students have to take up a small research project under the supervision of a teacher from the department or may carry the work in an industry / NGO / private laboratory with required facility/other university or institution. If a student is doing project out side the university then the chemicals to carry out experiment shall be replaced to the institute where he/she carry out the experimental work. All other arrangements are to be made by the student. Student has to submit the dissertation before the last date for the submission as declared by the university.

HOME-SCIENCE

CONSUMER SAFETY -TESTING

Paper no.- HSRM – 401

CC -10

Credits -4+0=4

Sem. – 4 (M.Sc. R.M.)

Marks – 100 +0= 100

Objectives

- To sensitise the students about consumer safety
- To gain experience in conducting consumer research and product testing
- To understand and apply the techniques of analysing consumer goods for product safety and performance.

Unit-1 Products and Services available to consumers.

- Products –Types , design requirements, quality requirements, performance appraisals : after sale services.
- Services-types , qualitative assessment techniques.
- Consumer safety, hazards and liabilities with reference to all consumer goods and services.
- Warranties, guarantees and sales contracts
- Consumer, research and product safety, environmental effects.

Unit-2 Quality control and Standardisation for

- Food
- Textiles
- Consumer durable
- Building materials

Unit-3 Food Testing & Textile testing

- Sensory evaluation
- Qualitative tests to detect common adulterations in milk and milk products, fats and oils, spices and condiments, tea, coffee etc.
- Fibre identification
- Tests for serviceability, wear and abrasion; colour fastness, fabric dimensions and fiber contents.

Unit-4 Equipment testing, Drugs & Medicines

- Testing of electrical appliances
- Testing of consumer items- comparative study of various brands for performance, fuel efficiency and end products.

REFERENCES

1. Chadha, R(1995): The Emerging Consumer, New age International Publishers Limited and Willey Eastern Limited, New Delhi.
2. S. George Getz(1991): The Consumer and the Law, Wiley Eastern Limited.
3. J.F.Engle, R.D.Black Well (1990) Consumer Behavior, 4th Edition, Holt Sanders International Editions, Chicago.
4. Test ISI Booklets on Textiles, Appliance and Food Material.

SERVICES RESIDENCES & ESTABLISHMENTS

Paper no.- HSRM – 402

CC -11

Credits -3 +1=4

Sem. – 4 (M.Sc. R.M.)

Marks – 100 +50= 150

OBJECTIVES

- ❖ To familiarize the students with the various services in residences and other establishments.
- ❖ To analyze the services with respect to design cost and maintenance.

UNIT : 1 Water supply system.

- Water supply system to residential buildings.
- Water tanks, water pipes, traps used in water supply.
- Bye – laws related to water supply.
- Types of drainage lay out.

UNIT : 2 Electric layout and wiring systems .

- Types of wires and conduits.
- Wiring systems – wiring for fans and tube light.
- Wiring for domestic appliances .

Special service.

- Types of air conditioning.
- Air condition ducting layout.
- Bye – laws related to electricity.

UNIT : 3 Fire Fighting.

- Fixtures and fittings – Vermi Composting.
- Fire fighting layouts – Vermi Culture.

- Fire fighting layout

UNIT : 4

- Acoustic materials.
- Techniques of implementing acoustic treatment.
- Techniques of inter communication system.
- Garbage disposal for multi – storied buildings.

PRACTICALS

- 1) Study of water supply system, drainage system and electrical layout.
- 2) Preparation and electrical layout.
- 3) Preparation and maintenance of compost pits few garbage disposal – Vermiculture.
- 4) Layout for inter – communication system.

REFERENCES

- 1 Deollikar S.G. (1991) – Plumbing Design & Practice, Tata mc Graw Hill Publishing Co., New Delhi.
- 2 Pangwala S.C. (1992) Water supply & Sanitary, Engineering charot ar publishing House, Anand.
- 3 Patil, S.M (1995) – Plumbing Engineering, Seana Publications , Bombay.
- 4 Kamala, A. and kanthorao, D.L. (1988) Environmental Engineering Water Supply, Sanitary Engineering & Pollution, Tata Mc Graw – Hill Publishing Company Ltd., New Delhi.
- 5 Hussain, S.K. (1974) Text Book of water supply sanitary Engineering, oxford & TBH publishing co. pvt. Ltd. New Delhi.
- 6 Anwali, P.M. (1981) Electrical Appliances Theory & Repair, R.B. Publications, New Delhi.
- 7 Pitke sham (1978) vidyut shastra, Majes tic Publication (marathi book) Mumbai.

ADVERTISING AND MARKETING

Paper no.- HSRM –403

CC -12

Credits -4 +0=4

Sem. – 4 (M.Sc.R.M.)

Marks – 100 +0 = 100

OBJECTIVES

- ❖ To become aware of different market organizations in our economy.
- ❖ To understand the different, marketing functions and the distribution system in our economy.
- ❖ To familiarize with the marketing strategies and market Research.
- ❖ To understand the role of advertising in sales promotion.

UNIT : 1 Market Economy.

- Markets, marketing, marketing functions.
- Marketing environment
Strategic planning and marketing information, steps in marketing process.
- Analyzing the environment.
- Marketing information system
- Planning marketing strategy.
- Role and types of marketing Research.
Marketing segmentation.
- Major markets – consumer and organizational.
- The process of market segmentation.
- Segmentation strategies

UNIT : 2

Product development and forecasting.

- Developing, testing and launching new Products.
- Idea generation, screening and business analysis
- Understanding market demand and consumer adoption process.
- Labeling and packaging.
- Estimating current and future demands.
- Stages in product life cycle.

UNIT : 3 Pricing practices and consumer interest pricing. Stamping on packages.

Advertising and Sales Promotion.

- Advertising objectives, functions, benefits.
- Advertising budget and costs of sales promotion.
- Types of advertising
- Evaluation of advertising claims.
- Advertising legislation.
- Ethics and self – regulation.

Personal selling and sales management.

- Characteristics and importance.
- Creative selling process.
- Organizing sales force, training personnel.
- Motivation, evaluation and control of sales force

UNIT : 4

Sales Promotion and Public relations

- Nature and growth of direct marketing.
- Designing a sales promotion programs.

Evaluating and controlling market performance

- Sales analysis.
- Market share and financial analysis.
- Customer satisfaction index.
- Impact of technology on marketing

- Global marketing.
- Service marketing.**
- Marketing strategies.
- Maintaining quality in services .

PRACTICALS

- 1) To make survey regarding one product with different brands available in market.
- 2) To make survey regarding consumer product with respect to market.
- 3) To compare advertising with product.
- 4) To prepare advertisement on particular product with planning.
- 5) Practical regarding theory

REFERENCES

- 1) Barotia, G.R. & Sharma N.K. (1998) : Effective Advertising, Marketing and sales Management, Managaldeep Publications, Jaipur.
- 2) Dhar, P.K. (1991) : Indian Economy – Its Growing Dimensions, Kalyan Publishers, New Delhi.
- 3) Hawalding D.I. best, R.J. ceney, K.A. (1983) : Consumer Behaviours, Revised Ed. Newman J.W. Motivation Research & Marketing Management, Prectice Hall.
- 4) Kotter, Philip, (1983) : Marketing Management. Analysis, Planning and control, Practice Hall Ltd, New Delhi.
- 5) Schiffman G. Leon, Kauk Lezer Laslie (1992) : Consumer Behaviour, Prentice Hall Ltd, New Delhi.
- 6) Zikmund G. William & Michan d'aunico (1996) : Basic Marketing. Wes t Publishing co.
- 7) Noz, M. Parhkas V.N. Montesio (1994) : Advertising (4th Edition). Vishal prakashan publication.
- 8) Terodkar, etal (1984) : Advertising, 6th Edition, vipul prakashan, Mumbai.

SCIENTIFIC WRITING

Paper no.- HSG– 404

ES -4

Credits - 2 +2=4

Sem. – 4 (M.Sc. R.M.)

Marks – 50 +50= 100

OBJECTIVES:-

1. To be able to appreciate and understand importance of writing scientifically
2. To develop competence in writing and abstracting skills.
3. To develop skill to write either a draft research proposal or a chapter of dissertation

UNIT : 1

- Scientific writing as a means of communication.
- Different forms of scientific writing articles in journals, research notes and reports, review articles, monographs, dissertations, bibliography etc.
- Formulation of outlines.

UNIT : 2

- Kinds of outlines> topic outlines, conceptual outlines, sentence outlines.
- Drafting Titles, Sub titles, Tables. Illustration.
- Tables as systematic means of presenting data in rows and columns.
- Formatting tables ; Titles, Body stub, Stub column, Column head, Spanner Head, Box head.

UNIT : 3

- Appendices – use & guidelines.
- Parts of Dissertation/Research Report Articles.
- Writing for grants.

UNIT : 4

Objectives, importance theoretical conceptualization, pilot study, Research proposal and time frame/methodology clear organization, outcome of study and its implications, budgeting, infrastructure and resources.

Executive summary.

PRACTICAL :-

- To learn scientific writing for research proposal, dissertation etc.
- To write book review, research report, Research review etc.

REFERENCES :-

1. HURMAN e & Montagnes,1 (Eds.)(1997). The Thesis and the Book. New Delhi Vistar.
2. APAC (1984) Publication manual of American Psychological Association (3rd Edition), Washington : APA.
3. Cooper,H.M. (1990) Intergrating Research : A guide for literature Review (2nd Edition) California : sage.
4. Sternberg, R.J. (1991). The Psychologist's companion : A guide to scientific writing for students & Researchers,Cambridge C.U.P.
5. Wolcott,H.F. (1990) Writing up Qualitative Research,Newbury Park,Sage.

STATISTICAL TESTING AND INTERPRETATION

Paper no.- HSG -405

ID - 4

Credits -4 +0=4

Sem. -4 (M.Sc.R.M.)

Marks – 50 +0= 50

OBJECTIVES

1. To facilitate the students to become familiar and understand research .
2. To enable students to develop the requisite skills for conducting research.

UNIT : 1

- Measures of central tendency – Mean, Arithmetic Mode, Advantages and disadvantages and its application.
- Measures of dispersion – Definition, computations, Measures, Demerits, Uses and Properties of different measures of dispersion.
- Range, Mean deviation, Standard deviation, variance, Quartile deviation or Semi inter quartile range, Relative measures of Dispersion, Co - efficient of variance, Standard error, Probable error, Skewness and its measures and kurtosis.

UNIT : 2

- Correlation and Regression – correlation – co – efficient of correlation, Karl pearson method, Coefficient of rank co – relation and product

UNIT : 3

- Testing of hypothesis – steps in the hypothesis, testing – stating the null and alternative hypothesis, selection of sample statistics. selecting the level of significance. drawing conclusion – Tests for population means using large and small samples. test for comparison hypothesis testing .

UNIT : 4

- Introduction to designs – CRD, RBD, Factorial designs, Analysis and application in the field of home science.
- Selection of measuring instruments, Characteristics of a standardized test, reliability and validity.
- An introduction to test procedures, Test of significance, chi square (χ^2), F test and significance, “t” test and 2 score.

References :

- Kapoor, V.K; Business Mathematics, Sultan chand and Suris Delhi.
- Spiegel, M.R; Probability and statistics.
- Elphence, D.N; Fundamentals of statistics.
- Bhardvaj, R.S; Business statistics.
- Kapoor and Sexsens; Fundamentals of statistics.
- Shah, B.S ;]Cctr Aa>kDaxaS □a pepr – 1.
- Vohra, N.D; Quantitative Techniques in Management, Tata Mc Graw Hill, New Delhi.
- Chaudhary, C.N; Research Methodology, RBSA Publication, S.M.N.S. Highway , Jaipur, - Raj. India.
- Essentials of Agricultural Statistics, E.v. Divalcara Sastry, Pointer Publications, Jaipur, Raj. India.
- A Handbook of Agricultural statistics, Dr. S.R.S. Chandel, Achal Prakashan Mandiv 117/574, Pandunagar, Kanpur – 2

CONSUMER SAFETY -TESTING

Paper no.- HSRM – 401

CC -10

Credits -4+0=4

Sem. – 4 (M.Sc. R.M.)

Marks – 100 +0= 100

Objectives

- To sensitise the students about consumer safety
- To gain experience in conducting consumer research and product testing
- To understand and apply the techniques of analysing consumer goods for product safety and performance.

Unit-1 Products and Services available to consumers.

- Products –Types , design requirements, quality requirements, performance appraisals : after sale services.
- Services-types , qualitative assessment techniques.
- Consumer safety, hazards and liabilities with reference to all consumer goods and services.
- Warranties, guarantees and sales contracts
- Consumer, research and product safety, environmental effects.

Unit-2 Quality control and Standardisation for

- Food
- Textiles
- Consumer durable
- Building materials

Unit-3 Food Testing & Textile testing

- Sensory evaluation
- Qualitative tests to detect common adulterations in milk and milk products, fats and oils, spices and condiments, tea, coffee etc.
- Fibre identification
- Tests for serviceability, wear and abrasion; colour fastness, fabric dimensions and fiber contents.

Unit-4 Equipment testing, Drugs & Medicines

- Testing of electrical appliances
- Testing of consumer items- comparative study of various brands for performance, fuel efficiency and end products.

REFERENCES

1. Chadha, R(1995): The Emerging Consumer, New age International Publishers Limited and Willey Eastern Limited, New Delhi.
2. S. George Getz(1991): The Consumer and the Law, Wiley Eastern Limited.
3. J.F.Engle, R.D.Black Well (1990) Consumer Behavior, 4th Edition, Holt Sanders International Editions, Chicago.
4. Test ISI Booklets on Textiles, Appliance and Food Material.

SCIENTIFIC WRITING

Paper no.- HSG– 404

ES -4

Credits - 2 +2=4

Sem. – 4 (M.Sc. R.M.)

Marks – 50 +50= 100

OBJECTIVES:-

1. To be able to appreciate and understand importance of writing scientifically
2. To develop competence in writing and abstracting skills.
3. To develop skill to write either a draft research proposal or a chapter of dissertation

UNIT : 1

- Scientific writing as a means of communication.
- Different forms of scientific writing articles in journals, research notes and reports, review articles, monographs, dissertations, bibliography etc.
- Formulation of outlines.

UNIT : 2

- Kinds of outlines> topic outlines, conceptual outlines, sentence outlines.
- Drafting Titles, Sub titles, Tables. Illustration.
- Tables as systematic means of presenting data in rows and columns.
- Formatting tables ; Titles, Body stub, Stub column, Column head, Spanner Head, Box head.

UNIT : 3

- Appendices – use & guidelines.
- Parts of Dissertation/Research Report Articles.
- Writing for grants.

UNIT : 4

Objectives, importance theoretical conceptualization, pilot study, Research proposal and time frame/methodology clear organization, outcome of study and its implications, budgeting, infrastructure and resources.

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PRACTICAL :-

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2. APAC (1984) Publication manual of American Psychological Association (3rd Edition), Washington : APA.
3. Cooper,H.M. (1990) Intergrating Research : A guide for literature Review (2nd Edition) California : sage.
4. Sternberg, R.J. (1991). The Psychologist's companion : A guide to scientific writing for students & Researchers,Cambridge C.U.P.
5. Wolcott,H.F. (1990) Writing up Qualitative Research,Newbury Park,Sage.

STATISTICAL TESTING AND INTERPRETATION

Paper no.- HSG -405

ID - 4

Credits -4 +0=4

Sem. -4 (M.Sc.R.M.)

Marks – 50 +0= 50

OBJECTIVES

1. To facilitate the students to become familiar and understand research .
2. To enable students to develop the requisite skills for conducting research.

UNIT : 1

- Measures of central tendency – Mean, Arithmetic Mode, Advantages and disadvantages and its application.
- Measures of dispersion – Definition, computations, Measures, Demerits, Uses and Properties of different measures of dispersion.
- Range, Mean deviation, Standard deviation, variance, Quartile deviation or Semi inter quartile range, Relative measures of Dispersion, Co - efficient of variance, Standard error, Probable error, Skewness and its measures and kurtosis.

UNIT : 2

- Correlation and Regression – correlation – co – efficient of correlation, Karl pearson method, Coefficient of rank co – relation and product

UNIT : 3

- Testing of hypothesis – steps in the hypothesis, testing – stating the null and alternative hypothesis, selection of sample statistics. selecting the level of significance. drawing conclusion – Tests for population means using large and small samples. test for comparison hypothesis testing .

UNIT : 4

- Introduction to designs – CRD, RBD, Factorial designs, Analysis and application in the field of home science.
- Selection of measuring instruments, Characteristics of a standardized test, reliability and validity.
- An introduction to test procedures, Test of significance, chi square (χ^2), F test and significance, “t” test and 2 score.

References :

- Kapoor, V.K; Business Mathematics, Sultan chand and Suris Delhi.
- Spiegel, M.R; Probability and statistics.
- Elphence, D.N; Fundamentals of statistics.
- Bhardvaj, R.S; Business statistics.
- Kapoor and Sexsens; Fundamentals of statistics.
- Shah, B.S ;]Cctr Aa>kDaxaS □a pepr – 1.
- Vohra, N.D; Quantitative Techniques in Management, Tata Mc Graw Hill, New Delhi.
- Chaudhary, C.N; Research Methodology, RBSA Publication, S.M.N.S. Highway , Jaipur, - Raj. India.
- Essentials of Agricultural Statistics, E.v. Divalcara Sastry, Pointer Publications, Jaipur, Raj. India.
- A Handbook of Agricultural statistics, Dr. S.R.S. Chandel, Achal Prakashan Mandiv 117/574, Pandunagar, Kanpur – 2

DEVELOPMENT OF THE SELF

Paper no.- HSG -401

CC-10

Credits -4 +0=4

Sem. -4 (M.Sc. H.D.)

Marks – 100 +0= 100

OBJECTIVES

- To initiate self- enquiry and introspection;
- To discuss different aspects of the self and its development;
- To contextualize the self in culture.

Unit -1. Definition of development and self & approaches

- Linking the individual and the group; self – concept and self – esteem.
- Enquiry and introspection. Memories of childhood and their influence.
- Family history and its impact on individuals.
- Biographies of significant persons as illustrations .

Unit -2 The self in the life -span

- Significance of birth; role of childhood experiences; changing roles and responsibilities
- With age; the sense of self at adolescence
- Cultural variations, achieving selfhood at adulthood

Unit -3 The individual and the context

- Influence of family, peers and school on the development of self – esteem..
- Community and culture in relation to the development of self.
- Biological, psychological and cultural aspect of being male and female, stereotypes, beliefs and gender discrimination
- Effect on the sense of self. Cultural and sub - cultural differences.

Unit -4 Role of spirituality and religion in the development of the self.

- Experiences, values, beliefs and attitudes in society.

References

1. Kakar, s. (1978). The inner world. New Delhi: Oxford University press.
2. Gandhi, M.K. (1927). An autobiography or the story of my experim ents with truth. Ahmedabad: Navajivan Trust.
3. Llewellyn- Jones, D. (1971).Every girl. London :Faber & faber
4. Llewellyn-Jones, D. (1971). Every woman. London: Faber & Faber.
5. Mead, M.(1976) Male and female. UK: Penguin.
6. Bee, H.(1989).The developing child. New York: Harper & Row.

AGEING IN MANAGEMENT PERSPECTIVE

Paper no.- HSHD –402

CC -11

Credits -3 +1=4

Sem. – 4 (M.Sc. H.D.)

Marks – 100 +50= 150

OBJECTIVES

- 1) To enable the students to know adulthood & ageing period.
- 2) To know the students about problems psychology & behaviours of adulthood and ageing.
- 3) To enable students to become aware and sensitized to issues related to care of elderly.
- 4) To develop skill for organizing activities for elderly.
- 5) To enable students to understand the theoretical perspectives of the ageing process.

UNIT : 1

- Types of age.
- The life span approach.
- Biological theories of ageing process.
- Physiological changes and its reasons.
- Longevity / life expectancy : Factors related to life expectancy.
- Theoretical perspective of ageing
 - Erikson's psychological approach.
 - Levinson's life structure.
 - Robert peck's theory.
 - Reigel's Dialectics of adjustment to developmental stage.

UNIT : 2

- Attitudes towards successful ageing / aged person.
- Family and social attitude towards ageing.
- Developmental tasks in Middle age.
- Characteristics of old age
- Developmental tasks in old age.

UNIT : 3

- Family pattern and Interpersonal relationship in middle and late adulthood.
- Problems of aged person.
- Adjustment in middle and late adulthood.
- Gender differences in adjustment.
- Sexual behavior in adulthood.
- Factors related to sexual behavior.
- Social and Family adjustment in middle and late adulthood.

UNIT : 4

- Work and Retirement :-
 - Types of retirement.
 - Feature related to retirement.
 - Effect of retirement, Adjustment with retirement.
- Leisure – definition, Types of leisure activities.
- Welfare program for aged person.
- Death and dieing.
 - Introduction, Types of Death.
 - Causes of Death in various age group.
 - Attitudes towards Death.
 - Research methods used in study o f ageing.

PRACTICAL

- 1) To study the developmental task of old age and middle age.
- 2) To study the attitude of old age persons, who stayed in old age home.
- 3) Study on Family attitudes towards ageing.
- 4) Visit of old age homes and Report writing.
- 5) Preparation of blue print for Ideal old age home.
- 6) Planning of various leisure activities for old age person.

REFERENCES

- Diane E. Papalia, "Human development", 5th Ed 1992, Tata megraw Hill, New Delhi.
- Rice F.P (1995), Human development, New Jersey:, Prentice Hall.
- Harlock Allizabath, " Developmental Psychology".
Berk Hayslip. Jr "Adulyhood Development and aging," 2nd Ed 1993. hoppercollis, college publishers, 10 East 53rd street, New York, Ny10022.
life span development' John W. Snatrouch 9th Ed. 2004.
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MARRIAGE & SEX EDUCATION

Paper no.- HSHD – 403

CC - 12

Credits -4 +0=4

Sem. – 4 (M.SC. H.D.)

Marks – 100 +0= 100

OBJECTIVES

1. To enable the students to acquire Knowledge of the importance and purpose of marriage.
2. To understand the student about importance of sex education.
3. To train the students for implementing sexuality education programs to learner.

UNIT : 1

- Introduction, meaning and purpose of marriage.
- Types and forms of marriage.
- Difference between Hindu marriage and Islam marriage system.
- Laws of Hindu marriage and Islam marriage system.
- Changes in marriage institution in modern India
- Advantages and Disadvantages of being Single

UNIT : 2

- The Dating system & Attraction and love.
- Mate selection Theories & Family Background factors for mate selection.
- Importance and types of fitness for marriage.
- The transition to marriage & Rites of passage for marriage
- Qualities of successful marriage & Adjustments early in marriage.
- The Art of marriage & Health and happiness for marriage.

UNIT : 3

- Concepts and complexity of Human sexuality & Human Development and Issues of sexuality.
- Perspective of sexuality.
- Theories of psychosexual development & Sociological side of sexuality.
- Sex instinct and the Art of sexual love.
- Difference between Male and Female in sexual Desire & Sexual Adjustment & Maladjustment.
- Sexual behaviour.

UNIT : 4

- Definition, Goals and Objectives & Reasons for Sexuality education Programs.
- History of sexual education & current trends in sexual education.
- The sexuality educator's sexual responsibility and qualifications.
- Physiological Aspects of sexuality.
- Areas of sexuality education programs.
- Rules of conduct of education for sexuality.
- Learning strategies for sexuality education & developmental characteristics of learner.
- Implementing a sexuality education programs.
- Evaluation of sexuality education programs.
- Effectiveness of sexuality education and the sexuality educators.

REFERENCES

- ❖ Bruess client and Greenbery Jerrold; 2009; sexuality education: Theory and Practice; 5th edition; Jones and Bratleft publishers.
- ❖ Rise, F. Philip; 1990; Intimate Relationships, Marriages and Families; 3rd edition; Mayfield publishing company.
- ❖ Raka sharan; 1991; A Handbook of society Indian perspecti res; Anmol publications.
- ❖ DaR. Xaah Ariv>d; 2007 ; =ityta Ane da>pTy nu> mnoiv)an; iDva[n pBllkexn.
- ❖ Xaah Ae.+ AeND dve je.ke; 1994 – 95 ; wartnI sam+k s>S4ano, AnDa p/ kaxn.

SCIENTIFIC WRITING.

Paper no.- HSG – 404

ES -4

Credits -3 +1=4

Sem. – 4 (M.SC. H.D.)

Marks – 50 +50 = 100

OBJECTIVES:-

1. To be able to appreciate and understand importance of writing scientifically
2. To develop competence in writing and abstracting skills.
3. To develop skill to write either a draft research proposal or a chapter of dissertation

UNIT : 1

- Scientific writing as a means of communication.
- Different forms of scientific writing articles in journals, research notes and reports, review articles, monographs, dissertations, bibliography etc.
- Formulation of outlines.

UNIT : 2

- Kinds of outlines> topic outlines, conceptual outlines, sentence outlines.
- Drafting Titles, Sub titles, Tables. Illustration.
- Tables as systematic means of presenting data in rows and columns.
- Formatting tables ; Titles, Body tab, Tab column, Column head, Spanner Head, Box head.

UNIT : 3

- Appendices – use & guidelines.

- Parts of Dissertation/Research Report Articles.
- Writing for grants.

UNIT : 4

Objectives, importance theoretical conceptualization, pilot study, Research proposal and time frame/methodology clear organization, outcome of study and its implications, budgeting, infrastructure and resources.

Executive summary.

PRACTICAL :-

- To learn scientific writing for research proposal, dissertation etc.
- To write book review, research report, Research review etc.

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3. Cooper,H.M. (1990) Intergrating Research : A guide for literature Review (2nd Edition) California : sage.
4. Sternberg, R.J. (1991). The Psychologist's companion : A guide to scientific writing for students & Researchers,Cambridge C.U.P.
5. Wolcott,H.F. (1990) Writing up Qualitative Research,Newbury Park, Sage.

STATISTICAL TESTING AND INTERPRETATION

Paper no.- HSG -405

ID - 4

Credits -4 +0=4

Sem. -4 (M.Sc.- C.T.)

Marks – 50 +0= 50

OBJECTIVES

1. To facilitate the students to become familiar and understand research.
2. To enable students to develop the requisite skills for conducting research.

UNIT : 1

- Measures of central tendency – Mean, Arithmetic Mode, Advantages and disadvantages and its application.
- Measures of dispersion – Definition, computations, Measures, Moments, Uses and Properties of different measures of dispersion.
- Range, Mean deviation, Standard deviation, variance, Quartile deviation or Semi inter quartile range, Relative measures of Dispersion, Co-efficient of variance, Standard error, Probable error, Skewness and its measures and kurtosis.

UNIT : 2

- Correlation and Regression – correlation – coefficient of correlation, Karl Pearson method, Coefficient of rank correlation and product

UNIT : 3

- Testing of hypothesis – steps in the hypothesis, testing – stating the null and alternative hypothesis, selection of sample statistics. selecting the level of

significance. drawing conclusion – Tests for population means using large and small samples. test for comparison hypothesis testing.

UNIT : 4

- Introduction to designs – CRD, RBD, Factorial designs, Analysis and application in the field of home science.
- Selection of measuring instruments, Characteristics of a standardized test, reliability and validity.
- An introduction to test procedures, Test of significance, chi square (χ^2), F test and significance, “t” test and 2 score.

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- Bhardvaj, R.S; Business statistics.
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- Chaudhary, C.N; Research Methodology, RBSA Publication, S.M.N. S. Highway, Jaipur, Raj. India.
- Essentials of Agricultural Statistics, E.v. Divalcara Sastry, Pointer Publications, Jaipur, Raj. India.
- A Handbook of Agricultural statistics, Dr. S.R.S. Chandel, Achal Prakashan Mandiv 117/574, Pandunagar, Kanpur – 208005.

ECO TEXTILES & ENVIRONMENT

Paper No HSCT (401)

CC-10

Credits – 4+0=4

SEM – 4(M.Sc. C.T.)

Marks : 100

Objectives

- To acquaint the students about the quality of various textile items as per international standard ISO 9000 for exporting to the European and other sophisticated global market.
- To create awareness about the toxic and harmful substance being used in textile processing need to avoid them.
- To acquire knowledge on Eco-auditing, Eco-labelling and Eco-Management.

Unit-1

- German Ban, Indian Banned Dyes, Eco -parameters, Eco-friendly textiles.
- Oeko-Tex standard

Unit-2

- Sensitizing Dyesstuffs- Allergenic Dyes, Carcinogenic Amines, harmful Dyes viz, Disperse, azo, acid, direct (commercial name and C.I. Number), Testing of Banned azo dyes.
- Red listed chemicals as per Eco-specification, Testing of Textiles and auxiliaries, effluent discharge.

Unit-3

- Testing facilities, Government and private, Laboratories, Testing Methods, Sources of Contamination of harmful chemicals in textiles.

Unit-4

- Eco-management for textile industry, and global scenario, eco -marks and environment friendly textiles.

References

- Shenai, V.A. (1997):Ecology and Textiles, Sevak Publications, Mumbai
- Shenai, V.S.(1998): Toxicity of Dyes and intermediates, Sevak publications, Mumbai
- Lever kusen (1998): German Legislation on azo Dyes -Dystar, Textilfarben,Germany.
- Shenai, V.A.(1999):Azo dyes-Facts &figure3s, Sevak publication, Mumbai

SCIENTIFIC WRITING.

Paper no.- HSG– 404

ES -4

Credits - 2 +2=4

Sem. – 4 (M.Sc.- C.T)

Marks – 50 +50= 100

OBJECTIVES:-

1. To be able to appreciate and understand importance of writing scientifically
2. To develop competence in writing and abstracting skills.
3. To develop skill to write either a draft research proposal or a chapter of dissertation

UNIT : 1

- Scientific writing as a means of communication.
- Different forms of scientific writing articles in journals, research notes and reports, review articles, monographs, dissertations, bibliography etc.
- Formulation of outlines.

UNIT : 2

- Kinds of outlines> topic outlines, conceptual outlines, sentence outlines.
- Drafting Titles, Sub titles, Tables. Illustration.
- Tables as systematic means of presenting data M rows and columns.
- Formatting tables ; Titles, Body stab, Stab column, Column head, Spanner Head, Box head.

UNIT : 3

- Appendices – use & guidelines.
- Parts of Dissertation/Research Report Articles.
- Writing for grants.

UNIT : 4

Objectives, importance theoretical conceptualization, pilot study, Research proposal and time frame/methodology clear organization, outcome of study and its implications, budgeting, infrastructure and resources.

Executive summary.

PRACTICAL :-

- To learn scientific writing for research proposal, dissertation etc.
- To write book review, research report, Research review etc.

REFERENCES :-

1. HURMAN e & Montagnes,1 (Eds.)(1997). The Thesis and the Book. New Delhi Vistar.
2. APAC (1984) Publication manual of American Psychological Association (3rd Edition), Washington : APA.
3. Cooper,H.M. (1990) Intergrating Research : A guide for literature Review (2nd Edition) California : sage.
4. Sternberg, R.J. (1991). The Psychologist's companion : A guide to scientific writing for students & Researchers,Cambridge C.U.P.
5. Wolcott,H.F. (1990) Writing up Qualitative Research,Newbury Park,Sage.

STATISTICAL TESTING AND INTERPRETATION

Paper no.- HSG -405

ID - 4

Credits -4 +0=4

Sem. -4 (M.Sc.- C.T.)

Marks – 50 +0= 50

OBJECTIVES

1. To facilitate the students to become familiar and understand research.
2. To enable students to develop the requisite skills for conducting research.

UNIT : 1

- Measures of central tendency – Mean, Arithmetic Mode, Advantages and disadvantages and its application.
- Measures of dispersion – Definition, computations, Moments, Moments, Uses and Properties of different measures of dispersion.
- Range, Mean deviation, Standard deviation, variance, Quartile deviation or Semi inter quartile range, Relative measures of Dispersion, Co-efficient of variance, Standard error, Probable error, Skewness and its measures and kurtosis.

UNIT : 2

- Correlation and Regression – correlation – co-efficient of correlation, Karl Pearson method, Coefficient of rank correlation and product

UNIT : 3

- Testing of hypothesis – steps in the hypothesis, testing – stating the null and alternative hypothesis, selection of sample statistics. selecting the level of

significance. drawing conclusion – Tests for population means using large and small samples. test for comparison hypothesis testing.

UNIT : 4

- Introduction to designs – CRD, RBD, Factorial designs, Analysis and application in the field of home science.
- Selection of measuring instruments, Characteristics of a standardized test, reliability and validity.
- An introduction to test procedures, Test of significance, chi square (χ^2), F test and significance, “t” test and 2 score.

References :

- Kapoor, V.K; Business Mathematics, Sultan chand and Suris Delhi.
- Spiegel, M.R; Probability and statistics.
- Elphence, D.N; Fundamentals of statistics.
- Bhardvaj, R.S; Business statistics.
- Kapoor and Sexsens; Fundamentals of statistics.
- Shah, B.S ;]Cctr Aa>kDaxaS □a pepr – 1.
- Vohra, N.D; Quantitative Teachniques in Management, Tata Mc Graw Hill, New Delhi.
- Chaudhary, C.N; Research Methodology, RBSA Publication, S.M.N. S. Highway, Jaipur, Raj. India.
- Essentials of Agricultural Statistics, E.v. Divalcara Sastry, Pointer Publications, Jaipur, Raj. India.
- A Handbook of Agricultural statistics, Dr. S.R.S. Chandel, Achal Prakashan Mandiv 117/574, Pandunagar, Kanpur – 208005.

CHEMISTRY

Paper : I CHN-701-(I) Inorganic Chemistry

Unit :- 1

© Inorganic photo Chemistry :

Introduction photochemical Laws & Kinetics, Photo physical & chemical processes of transition metal complexes. Photo isomerization of complexes.

Unit :- 2

© Mass Spectrometry

Principles & applications to Inorganic chemistry

Unit :- 3

© EXAFS, ESCA, Auger Electron Spectroscopy

Unit :- 4

© STM, AFM

- Luminescence Spectroscopy

Principles and applications to Inorganic Chemistry

Paper : II CHN-702-(I) Inorganic Chemistry

Unit :- 1

© Inorganic Polymers :

Borazine or borazole, substituted borazines, boron nitride, silicones, poly phosphonitrilic chloride, poly ortho phosphoric acids. Boro phosphate glasses, nitride of sulphur, thiazyl halides, imides of sulphur.

Unit :-2

© Co-ordination Polymers :

Nature & reactions yielding co-ordination polymers Various uses of Inorganic Polymers.

Unit :- 3

© Stereo chemistry of unusual co-ordination number:

Definition, stoichiometry, stereo chemistry, establishment of structure by IR Spectra, bonding and electronic structure.

Unit :- 4

© Molecular Polyhedra :

Boron Hydrides & Higher boranes, three centre bonds, basic assumptions, three centre orbitals in known structures the equation of balance, topological theory & its applications.

Paper : III CHN-703(I)(Crns)

Unit :1

Factors affecting on the corrosion of Iron Steel :

Aqueous environment, Effect of dissolved oxygen, Temperature, pH, salts metallurgical factors, varieties of Iron Steel, composition, heat treatment.

Unit : 2

Inhibitors and Passivators :

Theories of passivity, Mechanism of passivation, Application of passivators.

Packing inhibitors, slushing compounds, vapour phase inhibitors.

Unit :3

Cathodic and Anodic protection :

Theory of cathodic protection, Methods of cathodic and anodic protection.

Unit :4

a. Coatings for corrosion resistance :

Methods of application, classification, Inorganic and organic coatings.

b. Alloying for corrosion resistance :

Stainless steel, Monel metal, Incecel, Hastalloy.

Paper : III CHN-703(I)(Coord) Co-ordination Chemistry

Unit :-1

© Other methods of studying coordination compounds :

Molar conductivities, cyclic voltammetry, X-ray crystallography.

Unit :-2

© Magneto Chemistry :

Introduction. Origin of para-magnetism, Derivation of Van Vleck's equation, Calculation of magnetic susceptibility considering effect of spin-orbit coupling and magnetic fields as sequential perturbation. Ferromagnetism and Anti ferromagnetism. Anti ferromagnetic exchange pathways, direct metal-metal interaction. Super exchange model, magnetic susceptibility of binuclear complexes.

Unit :-3

© Complex equilibria :

Introduction. Computation of Stability constants from equilibrium data. Basic principles, Mathematical functions and their inter relationships. Method of computing stability constants.

© Half-integral n-values, correction term method, Graphical methods. Numerical methods Experimental determination of composition and stability, Solvent extraction. Ion exchange and polarographic methods.

Unit :- 4

© Applications of coordination compounds in various fields.

Paper : I CHN-701-(O) Organic Chemistry

Unit :-1

Ⓜ Carbohydrates :-

Type of Naturally occurring Sugars, Deoxy sugars, Amino sugars.

General method of structure and ring size determination with reference to Starch and Cellulose, Photosynthesis of Carbohydrates.

Ⓜ Purine & Nucleic Acid :-

Chemistry of Uric Acid, Adenine, Caffeine, Structure of Nucleotides, Nucleosides, DNA, RNA and Conformations, Protein synthesis, Perbiotic Chemistry.

Unit :- 2

Ⓜ Conformational Analysis :-

- Conformation of Cyclic System : Monocyclic compounds cyclo propane, cyclopropane 1,2 dicarboxylic acid, 2-OH-Methyl-1-cyclo propane dicarboxylic acid,1,3 ditertiary butyl cyclohexane 4-OH cyclo hexane carboxylic acid, cyclohexanone, 2,-Br-cyclo hexanone, 2-Br-4,4 dimethyl cyclo hexanone, cyclohexanol Hexa-chloro cyclohexane, cyclohexane 1,2 di carboxylic acid- conformation of Disubstituted Cyclohexanes,
- Bridge ring system, Bicyclic (1,1,1) Pentane and Bicyclo(2,1,1) hexane, Bicyclo (2,2,1) heptane and Bicyclo (2,2,2) octane.

Unit :- 3

Ⓜ Steroids :-

- General Biosynthetic studies of steroids, chemistry of Ergosterol & Lanosterol.
- Oestrogens :- Oestrone, Oestriol and Oestradiol.
- Gestogens :- Progesterone.
- Adreno cortical hormones :- Cortisone.
- Diosgenin and its utility in hormone synthesis.
- Transformation in steroids molecules.

Unit :- 4

® Advances in NMR :

Nuclear Overhauser effect, NMR shift reagents.

Correlation Spectroscopy, Theory, H-HCOSY, DQF H:H COSY, H-¹³C

COSY, HETCOR, HMBC, HMQC, TOCSY INADEQUATE

Paper : II CHN-702-(O) Organic Chemistry

Unit : 1

- Ⓐ Synthetic Industries based on petroleum :
 - Coal, petroleum, natural gas, organic chemicals from coal distillation refining of crude oil for industrial fuels, C1,C2,C3,C4 and aromatic chemicals.
 - Textile fibers classification, manufacture of important polyamide, poly ester fibers.

Unit :2

- Ⓐ Industries Paint and varnish- Classification of paints manufacture of paints. Methods of applying paints. Application. Varnish – Raw materials, manufacture of varnishes types of varnishes.
- Ⓑ Explosives, Propellants and toxic Chemical Agents :
 - Types of Explosives, Characteristics of explosive, Industrial explosives, Propellants, Rockets and Missiles, Propellants for Rockets, Miscellaneous industrial Explosives uses, Pyrotechniques, Military explosives, Incendiaries, Toxic chemical agents (Weapons)

Unit :3

- Ⓐ Industrial Polymers :
 - Polyethylenes – Introduction, Manufacture, low and high density polyethylene co-poly-mers of ethylene and application.
 - Monomers – Dacron, orlon, Bakelite, Nylon 6,6, Teflon polymer reactions – Hydrogenation, Addition and substitution, aldehyde and ketonic group reactions. Cyclization reaction, Cross linkage reaction.
 - Resins – Introduction preparation, Mechanism type of resin, Applications
 - Acrylic Polymer
 - (1) Poly acrylated and polymethyl acrylate.
 - (2) Poly methylmeth acrylate.
 - (3) Poly acrylo nitrile.

Unit :4

- Ⓐ Selected small scale industries: safety matches, Agarbatties, naphthalene balls, candles, shoe polish, Gum paste, pen ink, removal of stains, Phenyl disinfectant, soaps, detergents.

Paper : III CHN-703-(O) Organic Chemistry

Unit :1

® Chemotherapeutic Drugs :

- Antimalarial Agent :- Chemotherapy of Malaria, - Malarial parasite and it's cycle, - 4-Aminoquinolines, - 8-Aminoquinolines, 9-Aminoacridines, Di-Aminopyrimidines.
- Antiamoebic Drugs
- Antitubercular and Antileprotic Drugs
- Antifungal Drugs and Antiviral Drugs.

Unit :2

® CNS Drugs OR Psychopharmacological Agents:

- Antipsychotics
- Antidepressant
- Antianxiety
- Hallucinogenic Drugs
- Anticonvulsants
- Sedative & Hypnotics
- Antiparkinsonism Drugs
- General Anaesthetics

Unit :3

® Drugs Acting on the Cardiovascular Haematopoetic and Renal Systems:

- Cardiac Drugs
- Di – Uretics

Unit :4

- Antidiabetic Drugs. (Hypoglycemic Drugs)
- Hypertensive Drugs
- Anticancer Drugs

Paper – I CHN-701(P) Physical Chemistry

Unit :- 1

☀ Photo Chemistry – 2

- Nature and importance of singlet and Triplet oxygen.
- Quenching of fluorescence by $3 O_2$, Kinetics of photoperoxidation reaction.
- Mechanism of ene reaction., Cycloaddition reactions., Photosubstitution reduction.
- Transition metal complex., Metal complex sensitizers, water photolysis, nitrogen fixation and CO_2 reduction.
- Solar energy conversion and storage.,
- Chemiluminescence.

Unit :- 2

☀ Nuclear Chemistry :-

- Decay Kinetics, Half life and average life, nuclear deexcitations, Parent-daughter decay growth relationship, Theory of α -decay, and β -decay.
- Nuclear Models: Shell model, liquid drop model and Semi-empirical equation, Fermi gas model, Collective model.
- Types of Nuclear Reaction : Photo and thermal reaction, Nuclear fusion and Nuclear fission.
- Artificial radioactivity, Synthesis of radio isotopes of Na and C., Accelerators, Synchrocyclotron, Betatron.
- Application of radioisotopes in chemical investigations, Age determination medicinal applications, Analytical application Industrial applications.

Unit :-3

☀ Chemical Kinematics

- Mechanism of mono molecular reaction, Lindemann, Hinshelwood, RRK, RRRM and Slater, Conventional transition state theory.
- Branched chain reactions, Explosion limits, A Kinetic isotope effect (Primary and Secondary).
- Theory of absolute reaction rate, Applicable to reaction in solution (ideal and real solution), Linear free energy relationship and Hammett equation, Deviation from Hammett equation.
- Kinetics of organic decomposition of CH_3CHO and butane.

Unit :-4

☀ Spectroscopy :-

- UV- visible : Principle, Instrumentation, determination of pK value of Indicator, and Instability constant, Qualitative and quantitative Analysis.
- Raman spectroscopy : Raman effect, Difference from IR and fluorescence, Nature of spectra, Selection rule, Basic Instrumentation and applications.
- Atomic absorption spectroscopy : Basic principle, Advantages over flame emission spectroscopy, Basic instrumentation and applications.
- Emission spectroscopy : Basic principle, Radiative and non radiative decay, Internal conversion, Basic Instrumentation and applications.

Paper – II CHN-702(P) Physical Chemistry

Unit :- 1

- **Principles of Reactivity** : Mechanistic significance of entropy, enthalpy and Gibb's free energy. Arrhenius equation. Transition state theory. Uses of activation parameters. Hammond's postulate. Bell-Evans-Polanyi principle. Potential energy surface model. Marcus theory of electron transfer- Reactivity and selectivity principles.
- **Structural Effects on Reactivity** : Linear free energy relationships (LFER). The Hammett equation, substituent constants, theories of substituent effects. Interpretation of σ -values. Reaction constant ρ . Deviations from Hammett equation. Dual-parameter correlations, inductive substituent constant. The Taft model, σ_1 -and σ_R – scales.

Unit -2

- **Electrochemical reaction of special** : Electrocatalysts and electrocatalysis, Special features of electrocatalysis, Electricity storage density, Energy density and power, Electricity storage using alkali metals and non aqueous solutions.
- Ionic liquids : Definition, Features of ionic liquids, Methods of simple ionic liquids (Lattice oriented models), Solvent properties of fused non-metallic oxides, Fused oxide system in metallurgy.
- **Protons in solution** : Proton solvation, Heat of Hydration of proton, Proton Transport (Abnormal mobility of proton, conduction by chain reaction, Quantum mechanical proton jumps), Proton mobility in ice.

Unit :-3

- **Solvation and Solvent Effects** : Qualitative understanding of solvent-solute effects on reactivity. Thermodynamic measure of solvation. Effects of solvation on reaction rates and equilibria.
- Various empirical indexes of solvation based on physical properties, solvent-sensitive reaction rates, spectroscopic properties and scales for specific solvation.
- Use of solvation scales in mechanistic studies. Solvent effects from the curve-crossing model.

Unit :- 4

- **Capillary electrophoresis** : Basic, Principles, Instrumentation & Applications.
- **Coulometry and Chronopotentiometry**: Basic, Instrumentation & Application.
- **Polarography**: Principle, wave equations, Instrumentation & Application. Voltammetry (Cyclic voltametry, Anodic stripping)
- **Amperometry** : Basic Principle, Instrumentation & Application

Paper – III CHN-703(P) Physical Chemistry

Unit :- 1

- **Copolymerization** : Basic, Kinetics of free Radical Copolymerization, Binary co-polymerization equation, Types of co-polymerization (Alternate, Ideal, Random Alternate, Block and Crystallinity)
- Composition of copolymers, Reactivity Ratios.
- **Step polymerization**: Mechanism of step polymerization, polyfunctional step polymerization.
- **Crystallinity in polymer** : Degree of crystallinity, Determination of Crystallinity, Morphology of Crystalline Polymer (Lamellae, spherulites, Helix),

Unit :- 2

- **Polymer Synthesis** : bulk polymerization, precipitation, Emulsion polymerization, Suspension polymerization, Interfacial polymerization,
- Methods for determination of average molecular weight of polymer: (colligative property measurement, Light Scattering method, Dilute solution viscometry, Ultra Centrifugation,
- **Weight Distribution Methods** :Gel Permeation Chromatography and others.

Unit :- 3

- **Rheology of polymer** : Hook's equation, Newton equation, Maxwell and Voigt model, Deformation behavior of materials Relaxation and Retardation.
- **Polymer Processing** : Compounding, Casting, Moulding, Foaming, Reinforcing, Fiber spinning.

Unit :- 4

- Analysis and Testing of Polymer
- Chemical analysis
- Spectroscopic methods
- X- Ray Diffraction Analysis
- Microscopy
- Thermal Analysis
- Physical Testing

Paper – I CHN-701(A) Analytical Chemistry

Unit :1

- A. Automated laboratory analysis, Continuous flow analysis & flow injection analysis, Sample conditioning, Automated process control.
- B. Spread sheet, its applications
- C. Basic concepts of electronics and computer. Analog and Digital signals counting and arithmetic operations with binary numbers - Basic digital circuit components, AC circuit, DC circuit- capacitors- semiconductors and semi conductor devices- Transistors- Transducers, Thermocouple-Transformed. Read out devices - Microprocessor and micro computers computer software - computer Network - Applications of computers in Analytical chemistry and their examples.

Unit :2

- A. Precipitation titrations : Introduction, feasibility of precipitation Titration, determination of end points in precipitation titrations Indicators for precipitation titrations involving silver, Mohr's method & Volhard method factors affecting the solubility of precipitations equilibria (solubility product) effect of acidity precipitates on solubility of precipitates post precipitation & coprecipitation.
- B. Complexometric titrations :- Introduction, formation constant or stability of complexes, Requirements of complexometric titrations, conditional stability constants Influence of pH on stability of complexes & basicity of Z - ion on complex formation. Titration curves Equilibria involved in EDTA titrations, Types of EDTA titrations, Indicators for EDTA titrations metal ion indicator - Applications of the complexometric titrations to analyte ores, drugs & foods..

Unit :3

Environmental Analysis :-

Hydrosphere :- Water resource, Physical chemistry of sea water, sea water modal.

Microorganism : The catalyst of aquatic chemical reactions.

Soil :- Composition of soil, water & air in soil. Organic & Inorganic J components in soil. Nitrogen & NPK in soil. Wastes & pollutants in soil.

Environmental toxicology & Toxic elements in water, pesticides in water, Impact of toxic chemicals on enzymes. Biochemical.

effect of pesticides. Instrumental techniques in Environmental chemical analysis.

Potable & sanitary water, Analytical

procedures for characterization of water, characterization & analyses of industrial waste water.

Unit :4

- A. Analysis of food :- General method for determination of water,Protein, total amino acids & fats, measurement of food contamination.
- B. Analysis of oil & Fat:- Acid value R.M value, P.V.value, saponification value,Iodine value, Ester value, Acetyl value, Titre value. Peroxide value, Ratio of saturated & unsaturated fatty acids, Thiocyanogen number, Detection of adulterants.
- C. Insecticide & Pesticide analyses : - ISI specifications & Analysis of BHC, DDT, Malathion.

Paper – II CHN-702(A) Analytical Chemistry

Unit :1

Photoacoustic spectroscopy: Theory, instrumentation & applications.

Phoelectron spectroscopy (Fluorescence): Principle, techniques, instrumentation & applications (fluorometers & spectro fluorometers)

Unit :2

Neutron & electron Diffraction plasma emission.

Unit :3

Electron spin Resonance (ESR) : technique Hyperfine splitting, Relaxation process and line width in ESR, transition, g-value- its determination & factors affecting it, zero field splitting, Kramer's degeneracy.

Mossbauer spectroscopy :- emission & absorption of γ -rays, Mossbauer spectrometer. & information from the spectra.

Unit :4

Mass spectrometry :- Introduction, principle, Ionization of Molecule, fragmentation, Interpretation of mass spectra, Ion Sources, Mass spectrometers applications ICR (Ion Cyclotron Resonance) & FT-ICR spectroscopy.

Laser :- Production & characteristic of lasers (solid ,dye & gaseous Lasers),use of lasers as sources in various spectroscopic methods.

Paper – III CHN-703(A) Analytical Chemistry

Unit :1

Potentiometry : classification of indicators electrodes, location of equivalence point, null point potentiometry, classes of potentiometric titrations.

Coulometry - Methods of coulometry, applications, coulometric titrations- advantages & disadvantages electrogravimetry

Unit :2

Polarography & Voltammetric method Principle, Instrumentation, Half-wave potential, Ilkovic equation, Derivation of a relation between half-wave potential & diffusion coefficient, Evaluation methods, Applications of polarography - AC polarography square wave polarography , pulse-polarography, Amperometric titrations - Biamperometric titration Titration with rotatory platinum micro electrode. Polarimetry & Refractometry :- Theory & applications.

Chrono potentiometry, Introduction Instrumentation & applications

High frequency conductance measurements, Types of all Instrumentation & applications. Coulometry - Methods of coulometry, applications, coulometric titrations- advantages & disadvantages electrogravimetry

Unit :3

- (i) Radio Chemical Methods.
- (ii) Nephelometry & Turbidimetry

Unit :4

Magneto chemistry :- Magnetic moment, Electronic spectrum & structure, Van vleck equation, Zeeman effect,

Antiferromagnetism & ferromagnetism correlation of magnetic & structural-properties

Surface characterization by spectroscopy & Electromicroscopy:- Introduction, spectroscopic. methods for surface analysis

CHN – 704 (A) Organometallic Chemistry

Organotransition Metal Chemistry

60 Hrs (2 Hrs/week)

I Alkyls and Aryls of Transition Metals

5 Hrs

Types, routes of synthesis, stability and decomposition pathways, organocopper in organic synthesis

II Compounds of Transition Metal-Carbon Multiple Bonds

12 Hrs

Alkylidenes, alkylidynes, low valent carbenes and carbynes- synthesis, nature of bond, structural characteristics, nucleophilic and electrophilic reactions on the ligands, role in organic synthesis

III Transition Metal π -Complexes

18 Hrs

Transition metal π -complexes with unsaturated organic molecules, alkenes, alkynes, allyl, diene, dienyl, arene and trienyl complexes, preparations, properties, nature of bonding and structural features. Important reactions relating to nucleophilic and electrophilic attack on ligands and to organic synthesis

IV Transition Metal Compounds with Bonds to Hydrogen

3 Hrs

Transition metal compounds with bonds to hydrogen.

V Homogeneous Catalysis

14 Hrs

Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation, Zeigler-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (oxo reaction), oxopalladation reactions, activation of C-H bond.

VI Fluxional Organometallic Compounds

8 Hrs

Fluxionality and dynamic equilibria in compounds such as η^2 -olefin, η^3 -allyl and dienyl complexes

Books Suggested

- 1 Principles and Application of Organotransition Metal Chemistry, J.P. Collman, L.S. Hegsdus, J.R. Norton and R.G. Finke, University Science Books.
- 2 The Organometallic Chemistry of the Transition Metals, R.H. Crabtree, John Wiley
- 3 Metallo-organic Chemistry, A.J. Pearson, Wiley.
- 4 Organometallic Chemistry, R.C. Mehrotra and A. Singh, New Age International

CHN – 704(B) Organic Synthesis (II)

Organic Synthesis II

60 Hrs (2 Hrs/week)

I Disconnection Approach 18 Hrs

An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclisation reactions, amine synthesis

II Protecting Groups 5 Hrs

Principle of protection of alcohol, amine, carbonyl and carboxyl groups.

III One Group C-C Disconnections 7 Hrs

Alcohols and carbonyl compounds, regioselectivity. Alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis

IV Two Group C-C Disconnections 10 Hrs

Diels-Alder reaction, 1,3-difunctionalised compounds, α,β -unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annelation.

V Ring Synthesis 8 Hrs

Saturated heterocycles, synthesis of 3-, 4-, 5- and 6-membered rings, aromatic heterocycles in organic synthesis.

VI Synthesis of Some Complex Molecules 12 Hrs

Application of the above in the synthesis of following compounds:

Camphor, Longifoline, Cortisone, Reserpine, Vitamin D, Juvabione, Aphidicolin and Fredericamycin A.

Books Suggested

1. Designing Organic Synthesis, S. Warren, Wiley.
2. Organic Synthesis- Concept, Methods and Starting Materials, J.Fuhrhop and G. Penzillin, Verlage VCH.
3. Some Modern Methods of Organic Synthesis. W. Carruthers, Cambridge Univ. Press.
4. Modern Synthetic Reactions, H.O.House, W. A. Benjamin,
5. Advanced Organic Chemistry: Reactions, Mechanisms and Structure, J. March, Wiley.
6. Principles of Organic Synthesis, R. Norman and J. M. Coxon, Blackie Academic & Professional.
7. Advanced Organic Chemistry Part B, F. A. Carey and R. J. Sundberg, Plenum Press.

CHN – 704 (C) Chemistry of Materials

Chemistry of Materials

60 Hrs (2 Hrs/week)

I Multiphase Materials

5 Hrs

Ferrous alloys; Fe-C phase transformations in ferrous alloys; stainless steels, non-ferrous alloys, properties of ferrous and non-ferrous alloys and their applications.

II Glasses, Ceramics, Composites and Nanomaterials

5 Hrs

Glassy state, glass formers and glass modifiers, applications. Ceramic structures, mechanical properties, clay products. Refractories, characterizations, properties and applications.

Microscopic composites; dispersion-strengthened and particle-reinforced, fibre-reinforced composites, macroscopic composites. Nanocrystalline phase, preparation procedures, special properties, applications.

III Thin Films and Langmuir -Blodgett Films

5 Hrs

Preparation techniques; evaporation/sputtering, chemical processes, MOCVD, sol-gel etc. Langmuir-Blodgett (LB) film, growth techniques, photolithography, properties and applications of thin and LB films.

IV Liquid Crystals

10 Hrs

Mesomorphic behaviour, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; smectic - nematic transition and clearing temperature- homeotropic, planar and schlieren textures, twisted nematics, chiral nematics, molecular arrangement in smectic A and smectic C phases, optical properties of liquid crystals. Dielectric susceptibility and dielectric constants. Lyotropic phases and their description of ordering in liquid crystals.

V Polymeric Materials

5 Hrs

Molecular shape, structure and configuration, crystallinity, stress-strain behaviour, thermal behaviour, polymer types and their applications, conducting and ferro-electric polymers.

VI Ionic Conductors

8 Hrs

Types of ionic conductors, mechanism of ionic conduction, interstitial jumps (Frenkel); vacancy mechanism, diffusion superionic conductors; phase transitions and mechanism of conduction in superionic conductors, examples and applications of ionic conductors.

VII High T_c Materials

10 Hrs

Defect perovskites, high T_c superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials, normal state properties; anisotropy; temperature dependence of electrical resistance; optical phonon modes, superconducting state; heat capacity; coherence length, elastic constants, position lifetimes, microwave absorption-pairing and multigap structure in high T_c materials, applications of high T_c materials.

VIII Materials for Solid State Devices

3 Hrs

Rectifiers, transistors, capacitors -IV-V compounds, low-dimensional quantum structures ; optical properties.

IX Organic Solids, Fullerenes, Molecular Devices

9 Hrs

Conducting organics, organic superconductors, magnetism in organic materials.

Fullerenes –doped, fullerenes as superconductors.

Molecular rectifiers and transistors, artificial photosynthetic devices, optical storage memory and switches -sensors.

Nonlinear optical materials: nonlinear optical effects, second and third order - molecular hyperpolarisability and second order electric susceptibility - materials for second and third harmonic generation.

Books Suggested

- 1 Solid State Physics, N.W. Ashcroft and N.D. Mermin, Saunders College.
- 2 Material Science and Engineering, An Introduction, W.D. Callister, Wiley.
3. Principles of the Solid State, H.V. Keer, Wiley Eastern.
4. Materials Science, J.C. Anderson, K.D. Leaver, J.M. Alexander and R.D. Rawlings, ELBS
5. Thermotropic Liquid Crystals, Ed., G.W. Gray, John Wiley.
6. Handbook of Liquid Crystals. Kelker and Hatz, Chemie Verlag.

CHN-704(D) Computational Chemistry

Computational Chemistry

60 Hrs (2 Hrs/week)

I Fortran/C Programming and Numerical Methods

15 Hrs

Advanced programming features of FORTRAN/C. Basic theory, discussion of algorithms and errors for the following numerical methods. Examples from chemistry should be selected for illustrating the methods. The teacher may select ANY THREE of the following subtopics considering the background of students, available time etc.

a. Solution of Equations

Bisection, regular falsi, Newton-Raphson and related methods for solving polynomial and transcendental equations. Convergence. Errors and ill-conditioning.

b. Linear Simultaneous Equations

Gaussian elimination, Gauss-Seidel method, Gauss-Jordan method. Pivoting strategy. Errors and ill conditioning.

c. Eigenvalues and Matrix Diagonalization

Jacobi and Householder methods, analysis or errors.

d. Interpolation

Newton forward and backward difference, central differenced formulae. Lagrange and Hermite interpolation. Polynomial wiggle problem.

e. Numerical Differentiation

Solution of simple differential equations by Taylor series and Runge-Kutta methods.

f. Numerical Integration

Newton-Cotes formulae, Romberg integration, errors in integration formulae.

The students should develop computer programs for some of the above numerical methods.

II Running of Advanced Scientific Packages

15 Hrs

The students are expected to get hands on experience of running a few selected advanced level scientific software packages after a brief introduction to the basic theory and methodology. *ab initio* quantum chemical packages such as GAUSSIAN/GAMES with carefully designed exercises for illustrating various features of the packages. Semi-

empirical/Dynamics/Simulation packages such as MOPAC, CHARM, AMBER, QUANTA etc. Basic ideas on structure activity relation, drug and catalysis design etc.

III Introduction to Networking and Search using Internet 10 Hrs

IV Project 20 Hrs

The students will develop utilities such as analysis of spectra, simulation programmes which will supplement laboratory or theory exercises in physical, organic, inorganic chemistry or biochemistry. This list is only indicative and a variety of small projects designed by the teacher based on the interest of the student and capabilities should be worked out.

Books Suggested

1. Computational Chemistry, A.C. Norris, John Wiley.
2. Computer Programming in FORTRAN 77, R. Rajaraman, Prentice Hall.
3. Numerical Analysis, C. E. Frogberg, Macmillan.
4. Numerical Analysis - A Practical Approach, M.J. Maron, John Wiley.
5. Numerical Methods for Scientists and Engineers, H. M. Antia, Tata McGraw Hill.

CHN – 704 (E) Advanced Quantum Chemistry

Advanced Quantum Chemistry

60 Hrs (2 Hrs/week)

(Pre-requisite: Mathematics at least up to First Year B.Sc. level is necessary. At least one PC among 4 students should be available)

I Theoretical and Computational Treatment of Atoms and Molecules, Hartree-Fock Theory 12 Hrs

Review of the principles of quantum mechanics, Born-Oppenheimer approximation. Slater-Condon rules, Hartree-Fock equation, Koopmans and Brillouin theories, Roothan equation, Gaussian basis sets

II Configuration Interaction and MC-SCF 12 Hrs

Introduction to CI; full and truncated CI theories, size consistency. Introductory treatment of coupled cluster and MC-SCF methods.

III Semi- Empirical Theories 12 Hrs

A review of the Hückel, EHT and PPP treatments, ZDO approximation, detailed treatment of CNDO and INDO theories. A discussion of electronic energies and properties. An introduction to MOPAC and AM1 with hands on experience on personal computers.

IV Density Functional Theory 12 Hrs

Derivation of Hohenberg-Kohn theorem, Kohn-Sham formulation, N- and V-representabilities; review of the performance of the existing local (e.g. Slater Xa and other methods) and non-local functionals, treatment of chemical concepts with the density functional theory.

V Computer Experiments 12 Hrs

Computer experiments using quantum chemistry - software packages such as GAUSSIAN/GAMESS/MOPAC and modeling software e.g. MM2/ AMBER/CHARM etc.

Books Suggested

- 1 Modern Quantum Chemistry, N.S. Ostlund and A. Szabo, McGraw Hill.
- 2 Methods of Molecular Quantum Mechanics, R. McWeeny and B.T. Sutcliffe, Academic Press.
- 3 Density Functional Theory of Atoms and Molecules, R.G. Parr and W. Yang, Oxford.
- 4 Exploring Chemistry with Electron Structure Methods, J. B. Foresman and E. Frish, Goussian Inc.
- 5 Semi-empirical MO Theory, J.Pople and D.L.Beveridge.

CHN-705 (I) Practicals Inorganic Chemistry

1. Ore and Alloy analysis (at least six)
2. Preparation of complexes and their analysis (Any four)
 - a. Preparation of sodium cobaltinitrite and estimation of cobalt.
 - b. Preparation of potassium trioxalato chromite and estimation of chromium.
 - a. Preparation of potassium tri-oxalato-aluminate and estimation of Aluminum.
 - b. Preparation of N, N bis (salicylaldehyde) ethylenediamine and its Cu complex and estimation of Cu.
 - c. Preparation of N, N bis (salicylaldehyde) ethylenediamine and its Co complex and estimation of Co.
 - d. Preparation of N, N bis (salicylaldehyde) ethylenediamine and its Ni complex and estimation of Ni.

CHN-705-(O) Practicals Organic Chemistry

- (1) Organic Separation :
Separation, Purification and identification of three compounds (Ternary mixture) from 8 grams organics mixture by semimicro Method- Preparation of Derivative.
(Minimum Five mixtures should be done)
- (2) Organic Estimation (Semi micro methods)
Estimation of Isniazide.
Estimation of Ibuprofen.
T.L.C. of Drugs
T.L.C. of Dyes
- (3) Organic Preparation :
Two & Three stage preparations from 4 to 5 grams starting material by semimicro method (Minimum five should be done) including name reactions.
- (4) Spectroscopic problems : Identification of Organic compound by either spectral data or actual spectra (Combined UV-visible, HNMR, ¹³C NMR, Mass, IR)

CHN-705-(O) Practicals Physical Chemistry

Section – I

Minimum 04

1. To study the complex formation between Fe(III) and salicylic acid and find instability constant and free energy change by spectrophotometer.
2. Simultaneous spectrophotometric determination of Cr^{6+} & Mn^{7+} or As^{2+} & Sb^{3+} .
3. Determine the dissociation constant of indicator (Methyl red, O-nitrophenol, Phenolphthalein) by spectrophotometer.
4. Ultraviolet spectrophotometric determination of Aspirin, phenacetin and in APC table using solvent extraction.
5. Separation of analgesic Drugs by TLC.

Phenyl butazone	Caffeine
Aspirin	Phenacetin
Phenazone	Paracetamol
Dipyrene	Amido Pyrine
6. Separation of amino acid by TLC
Lycine, Valine, Glutamic acid.
7. To determine the capacity of anion / cation exchange resin by column method.
8. Gas chromatographic analysis of Tertiary mixture of Pentane, Hexane & Heptane.
9. Estimation of insecticides in water using HPLC.

Section – II

Minimum 04

1. Determine effect of Cl^- , Br^- or I^- ions on alkaline hydrolytic constant of n-butyl acetate conductometrically.
2. Determine adiabatic compressibility and intermolecular free length for interaction between DMSO & acetone for binary mixtures.
3. Determine ultrasound velocity for addition of NH_4Cl solution in water and acetone binary mixture at room temperature.
4. Investigate autocatalytic reaction between oxalic acid & potassium permanganate.
5. Study the kinetics of oxidation of propanol using an oxidant.
6. Determine mol. Wt of polymer by viscosity measurement/turbidity measurement.

7. Determine apparent mol. Wt of an electrolyte (KCl) in water & hence degree of dissociation (cryoscopic method).
8. Investigate effect of substitution of chloride ions on rate constant of inversion of cane sugar by using mono, di, & trichloro acetic acid as catalyst (polarimetry).
9. Determine the heat capacity of the calorimeter & concentration of unknown solution of benzoic acid by measuring heat changes during dilution.

Section III

Minimum 04

1. Determine the heat of solution of a solid compound (CaCl_2 , MgCl_2 or Synthesized / schiff's base) and also lattice energy of CaCl_2 using Bron-Haber cycle.
2. Study effect of ionic strength on activity coefficient and mean activity coefficient of silver ion in 0.01M silver nitrate solution (potentiometry)
3. Determine solubility of Ag_2CrO_4 potentiometry.
4. Amperometric titration for lead in solution with potassium dichromate.
5. Use of computer software to calculation thermodynamic properties of some compounds.
6. Use a computer program to determine buffer capacity & pH of any solution.
7. To determine the equivalent conductance of a weak electrolyte at infinite dilution using the khohlrauch law.
8. Discuss the primary salt effect in a reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI.

CHN-705 (A) Practicals

Analytical Chemistry

1. Ore analysis (at least four)
2. Alloy analysis (at least four)
3. Applied Analyses

ENVIRONMENTAL
SCIENCE

M.Sc. Environmental Science Curriculum

W.E.F. June -2011

Semester III

11. Environmental Monitoring Techniques	70 Marks
12. Environmental Management System and Risk Assessment	70 Marks
13. Environmental Laws. Policies and Public Participation	70 Marks
14. Elective Paper (From EES 09-12)	70 Marks
15. <i>Practical :III & Industrial Tour</i>	120 Marks

Semester IV

16. Major Project (Master's Thesis)	400 Marks
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The students will carry out this project work in the Department of Life Science under the guidance of any faculties of the department or in collaboration with any Institute of State/National level repute, any Industry or Govt. Orgation.

However one faculty member of the Department of Life Sciences shall remain as a co-guide.

List of elective papers :

EES-01	Conservation Biology and Wildlife Management (CBEM)
EES-02	Environmentally Sustainable Technologies (EST)
EES-03	Conservation and Restoration of Degraded Ecosystems (CRD)
EES-04	Conservation and Management of Marine Environment (CMM)
EES-05	Water and Waste Water Management (WRM)
EES-06	Solid waste Wastes and their management (SWM)
EES-07	Biodiversity Research, Monitoring and Management (BRM)
EES-08	Applied eco-informatics (AEI)
EES-09	Industrial Safety and Management (ISM)
EES-10	Conventional Energy and Carbon Offset Management (CEC)
EES-11	Eco-tourism and Conservation (ETC)
EES-12	Environmental Communication and Conflict Resolution(ECC)

Semester III

ES 301

Environmental monitoring Techniques

Section: I

Unit 1 Monitoring of Abiotic Environment

- **Standards for environmental quality assessment and monitoring**
- **Monitoring Protocols for Soil, Water and Air according to Indian Standards**
- **Monitoring ambient environment of industrial and domestic zones**
- **Monitoring non degradable elements in the environment**

Unit 2 Monitoring and Assessment of Biotic Environment

- **Monitoring ecosystems and biological diversity: Birds and Mammalian diversity**
- **Indicator species in the ecosystem and their monitoring**
- **Monitoring streams, wetland, rangeland and other man made ecosystems**
- **Monitoring marine environment**

Section: II

Unit 3 Monitoring Toxicity in the Environment

- **Basics of Toxicology: Introduction, Scope and Significance**
- **Toxic elements and their fate in the environment**
- **Toxicity measurement techniques (Toxicological Analysis)**
- **Detoxification: Methods, Applications and Significance**

Unit 4 Advanced Monitoring Techniques and Documentation

- **Monitoring and managing domestic and industrial Wastes**
- **Applying RS and GIS in environmental monitoring**
- **Bio-degradation and bio-deterioration of recalcitrant compounds**
- **Preparation of Environment Monitoring Report**

Section: I

Unit 1 Introduction of EMS

- Overview of Environmental Management System (EMS)
- EMS Audits and its significance
- Cleaner production (CP) management and its significance in EMS
- Planning and Preparing an EMS report

Unit 2 Environmental Impact Assessment and Auditing

- Concept, Process and Evaluation methodology
- Methods for EIA
- Preparation of EIA statements
- Concept of environmental audit
- Setting up an audit programme and Carrying out environmental audits

Section: II

Unit 3 Environmental Risks

- Basics, Definitions, Scope and significance of Studying Environmental Risks
- Evaluation of Risks, Risk Assessments and Risk Communication
- Hazard identification, Assessment and Control Techniques
- Legislations on safety and health in India

Unit 4 Environment and Disasters: Management and mitigation

- Definition, types of disasters, and their impact on man and environment
- Natural disasters and their management
- Man made disasters, their impact and solutions.

- Disaster management, relief operations, role of administration and NGO, emergency supply and rehabilitation

ES 303 *Environmental Laws, Policies and Public Participation*

Core Paper

Section: I

Unit 1 Environmental Laws

- Factory Act (1948)
- Environmental Protection Act (1986)
- Air pollution and prevention Act (1981)
- Forest Act (1927) and Wildlife (Protection) Act (1972)

Unit 2 Environmental Case Laws

- Bhopal Gas case
- Shri Ram Food and Fertilizer case
- M.C. Mehta Vs Union of India case (Ganga pollution case)
- Narmada Bachao case

Section: II

Unit 3 Communication techniques for Environment Conservation and Management

- Communication basics and Concept of Environment Communication
- Fund raising protocols and Grant writing process for environmental issues
- Stakeholder consultation process, Messaging, Advocacy and behavioral change
- Rio Earth Summit: Convention on Nation's Biodiversity, UN convention on climatic change

Unit 4 Environmental Education

- Background, goals, objectives, guided principles of Environmental Education
- Strategies for development: authorization, EE methodologies, and EE modeling
- Environmental movements in India, Eco-tourism, Eco-development and environmental ethics

- **Nature Education Camps and their impact evaluation on environment**

ES 304 Elective Paper (From EES 09-12)

EES-09 Industrial Safety and Management (ISM)

EES-10 Conventional Energy and Carbon Offset Management (CEC)

EES-11 Eco-tourism and Conservation (ETC)

EES-12 Environmental Communication and Conflict Resolution (ECC)

Semester IV Project Work (Masters' Thesis)

The student will carry out this project work in the Department of Life Science under the guidance of any faculty of the department OR in collaboration with any Institute of State/ National repute, any Industry, Govt. or Non Govt. Organization. However in such case, one faculty member of the Department of Life Sciences shall remain as a co-guide.

Student shall have to carry out Original Research Work OR Undergo industrial training with a specific Project/ Task for minimum of three months without break and submit a master's Thesis. He/She also need to give a presentation (Open house oral presentation of the work) during the Viva Voce examination to be conducted at the university campus only.

The Thesis shall be evaluated by the panel of three examiners as follow:

1. External Examiner
2. Thesis supervisor or Co-Guide of Internal Examiner

Same panel will also remain present at the time of presentation.

The distribution of Marks for M.Sc. Dissertation

1.	Masters' Thesis	150
	a. Internal Evaluation : 75	
	b. External Evaluation : 75	
2.	Viva- voce	050
3.	Presentation	050
	Total	300

Distribution of Marks in Sem IV :

1. Project work	300
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2. General Viva	050
3. Regularity and Performance	050