Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Faculty of Mathematical Sciences Syllabus:

Mathematics

Session 2021-22

Academic Session 2021-22

Index

Academic Session 2021-22

Academic Session 2021-22

PROGRAMME: B.Sc. (Hons.) Mathematics
PROGRAMME CODE:BSHM

The B.Sc.(Hons.) Mathematics develops scientific temper in Students. The Students can acquire basic mathematical skills and possess subject knowledge required for higher studies, professional and applied courses. Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.

ELIGIBILITY:

- The candidates having passed 10+2 Examination (Non-Medical) from recognized board.

PROGRAMME OBJECTIVES:

- To analyze the problem, identify the computing requirements and to find the appropriate solution.
- To equip the students with mathematical abilities and problem solving skills.
- Acquire good knowledge and understanding in advanced areas of mathematics.

PROGRAMME SPECIFIC OUTCOMES:

- To make students understand the concepts of different branches of sciences and it's applications to other disciplines.
- To train students in communicating mathematical ideas in lucid and effective manner.
- Toexpertise students to apply their theoretical knowledge and understanding to solve theoretical and applied problems in mathematics.
- The practical work using software/labs in mathematics and inter-disciplinary subjects will enable the students to analyze problems in a systematic and analytical way.
- Students will develop proficiency in inter-disciplinary subjects(Physics, Chemistry etc.) which will motivates students to pursue new knowledge in different subject areas.

CONTENT:

Scheme of Course B.Sc. (Hons.) Mathematics
Semester-I

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
I. Core Course Theory and Practical						
1.	COURSE CODE : BHMH- 101	Calculus-I	56	19	75	60
2.	COURSE CODE : BHMH - 102	Algebra-I	56	19	75	60

Academic Session 2021-22

3.	COURSE CODE: BHMH- 109	Math Lab-I	30	10	40	45
II. Generic Elective and Practical						
4.	COURSE CODE: BHMH- 103	Physics-I Optics	37	13	50	60
5.	COURSE CODE : BHMH- 104	Organic Chemistry-I	37	13	50	60
6.	COURSE CODE: BHMH-107	Physics Lab-I (Optics Lab)	22	8	30	60
7.	COURSE CODE: BHMH- 108	Organic Chemistry Practical-I	22	8	30	60
III. Ability Enhancement Compulsory Course						
8.	COURSE CODE: BHMH- 105	Communicative English	37	13	50	60
9.	COURSE CODE: BHMH- 106(A) COURSE CODE: BHMH-106(B)	Punjabi Compulsory OR Basic Punjabi	37	13	50	60
10.	DA 1*	**DrugAbuse**:Problem, Management and Prevention Problem of Drug Abuse (Compulsory ID)	50		50	2Lectures / Week
Total			334	116	450	465 Hrs. +2Lect./ Week

* Pass Cour

Academic Session 2021-22

Semester-II

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assesment in theory	Total	Hrs.
I. Core Course Theory and Practical						
1.	COURSE CODE: BHMH- 201	Calculus-II	56	19	75	60
2.	COURSE CODE: BHMH- 202	Algebra-II	56	19	75	60
3.	COURSE CODE: BHMH- 209	Math Lab-II	30	10	40	45
II. Generic Elective and Practical						
4.	COURSE CODE: BHMH-203	Physics-II Modern Physics	37	13	50	60
5.	COURSE CODE: BHMH- 204	Inorganic Chemistry-II	37	13	50	60
6.	COURSE CODE: BHMH- 207	Physics Lab-II	22	8	30	60
7.	COURSE CODE: BHMH- 208	Inorganic Chemistry Practical-II	22	8	30	60
III. Ability Enhancement Compulsory Course						
8.	COURSE CODE: BHMH-205	Communicative English	37	13	50	60
9.	COURSE CODE: BHMH-206(A) COURSE CODE: BHMH-206(B)	Punjabi Compulsory OR Basic Punjabi	37	13	50	60
10.	DA 2*	**DrugAbuse**:Problem, Management and Prevention Drug Abuse: Management and Prevention (Compulsory ID)	50		50	2Lectures/ Week
Total			334	116	450	465 Hrs. +2Lect./ Week

Chairperson, BoS in Mathematics

Academic Session 2021-22

*Pass Course

Academic Session 2021-22

Semester-III

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	COURSE CODE: BHMH- 301	Trigonometry and Advanced Calculus	56	19	75	60
2.	COURSE CODE: BHMH-302	Analysis	56	19	75	60
3.	COURSE CODE: BHMH- 303	Physics-III Electricity And Magnetism	37	13	50	60
4.	COURSE CODE: BHMH- 304	Physical Chemistry-III	37	13	50	60
5.	COURSE CODE: BHMH-305/ ESL221	Environmental studies-I*	50	-	50	2 Lectures/ Week
6.	COURSE CODE: BHMH- 306	Interdisciplinary Course ID-I Psychology	37	13	50	60
7.	COURSE CODE: BHMH-307	Physics Lab-III	37	13	50	60
8.	COURSE CODE: BHMH- 308	Physical Chemistry Lab- III	37	13	50	60
Total			297	103	400	420Hrs.+ 2 Lectures/ Week

*Pass Course

Academic Session 2021-22

Semester-IV

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	COURSE CODE: BHMH- 401	Mathematical Modelling and Differential Equations	56	19	75	60
2.	COURSE CODE: BHMH-402	Statics and Vector calculus	56	19	75	60
3.	COURSE CODE: BHMH-403	Physics-IV	37	13	50	60
4.	COURSE CODE: BHMH- 404	Molecular Spectroscopy-IV	37	13	50	60
5.	COURSE CODE: BHMH- 405/ESL 222	Environmental studies-II*	50	-	50	2 Lectures /Week
6.	COURSE CODE: BHMH- 406	Interdisciplinary Course ID-II Geography	30+7(Practical)	13	50	60
7.	COURSE CODE: BHMH-407	Physics Lab-IV	37	13	50	60
8.	COURSE CODE: BHMH- 408	Physical Chemistry Lab- IV	37	13	50	60
Total			297	103	400	420Hrs.+ 2Lectures/ Week

*Pass Course

Academic Session 2021-22

Semester-V

Sr.No.	Course No.	Course Title	Maximum Marks	Internal Assessment	Total	Hrs.
1.	COURSE CODE: BHMH- 501	Probability And Statistics	56	19	75	60
2.	COURSE CODE: BHMH-502	Group Theory	56	19	75	60
3.	COURSE CODE: BHMH-503	Number Theory	56	19	75	60
4.	COURSE CODE: BHMH- 504	Partial Differential Equations	56	19	75	60
5.	COURSE CODE: BHMH- 505	Introduction to Python	57 **(Theory:37) (Practical: 20)**	18 **(Theory:13) (Practical: 05)**	75	60
6.	COURSE CODE: BHMH- 506	Seminar and Assignment	20	5	25	30
Total			301	99	400	330

Academic Session 2021-22

Semester-VI

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	COURSE CODE: BHMH- 601	Linear Programming	56	19	75	60
2.	COURSE CODE: BHMH-602	Numerical Methods	56	19	75	60
3.	COURSE CODE: BHMH-603	Discrete Mathematics and Graph Theory	56	19	75	60
4.	COURSE CODE: BHMH- 604	Dynamics	56	19	75	60
5.	COURSE CODE: BHMH- 605	Linear Algebra	56	19	75	60
6.	COURSE CODE : BHMH- 606	Seminar and Assignment	20	5	25	30
Total			300	100	400	330

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-I
COURSE CODE: BHMH-101
COURSE TITLE: Calculus-I

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS: 60 hrs
MAXIMUM MARKS: 75
TIME: 3Hours **(THEORY: 56**
MEDIUM: English **INTERNAL ASSESSMENT: 19)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV respectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B , C, D and E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Calculus is very useful in science and engineering like determination of stationary points of functions in order to sketch their graphs, to study the rate of change of quantities, in solving problems related to velocity and acceleration and behavior of graphs of different functions.
- The content of this course is designed to make the students understand the concepts of limits and continuity of functions, the methods of differentiation of various types of functions, the points to have an idea about the shape of the graph of a function.

COURSE CONTENT:

Unit-I

Real number & its properties, Limit of a function, Basic properties of limits, Continuous functions and classifications of discontinuities.

Unit II

Differentiation of Hyperbolic functions, Successive Differentiation, Leibnitz's Theorem. Indeterminate forms.

Unit III

Cauchy's Mean Value Theorem, Taylor's and Maclaurin's theorem, Asymptotes, Concavity-Convexity, points of inflexion, multiple points, Curvature.

Unit IV

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem.

BOOKS PRESCRIBED:

1. Shanti Narayan and P.K. Mittal: Differential Calculus, S. Chand and Co.
2. S.P. Arya : Differential Calculus, Rastogi and Co.
3. S.C. Arora and Ramesh Kumar: A text Book of Calculus ,Pitamber Publication Co.
4. A.H.Siddiqi,P.Manchanda,M.Brokate,Calculus with Applications: I.K.International Publishing House, New Delhi.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the theory and applications of derivatives
CO2	Acquire knowledge on determining stationary points of functions in order to sketch their graphs
CO3	Understand the concepts of limits and continuity of functions.
CO4	Understand the applications of methods of differentiation of functions in predicting the shape of the graph of a function

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-I

COURSE CODE: BHMH- 102

COURSE TITLE: Algebra-I

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

MAXIMUM MARKS: 75

TIME: 3 hours **(THEORY: 56**

MEDIUM: English **INTERNAL ASSESSMENT: 19)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV repectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B, C, D and E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from section. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Algebra will help the students in expression of abstract ideas.
- Students will learn matrix algebra, vector spaces, eigen values and eigen vectors.
- Students will be able to recognize technical terms and appreciate some of the uses of tools of algebra.

COURSE CONTENT:

Unit-I

Rank of a matrix. Concept of equivalent matrices and to compute the rank of a matrix using equivalent matrix, normal form of a matrix, elementary operations on matrices and to determine the rank of a matrix by elementary transformations, Echelon form of a matrix and to determine row and column rank of a matrix by reducing it in echelon form.

Unit-II

Linear independence of row and column vectors. Row rank and Column rank of a matrix, Equivalence of column and row ranks., nullity of a matrix, Applications of matrices to solve a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit-III

Eigen values and Eigen vectors of a matrix, minimal and characteristic equation of a matrix. Cayley-Hamilton Theorem and its use in finding inverse of a matrix.

Unit-IV

Quadratic forms, Congruence of quadratic forms and matrices. Congruent transformtations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Classification of real quadratic forms in n- variables. Definite, semi definite and indefinite real quadratic forms. Characterstic properties of definite, semi definite and indefinite forms.

Academic Session 2021-22

BOOKS PRESCRIBED:

1. H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.
2. Shanti Narayan & P.K. Mittal : A Text Book of Matrices, S.Chand & Co.
3. M.K. Singal and Asha Rani Singal: Algebra, R. Chand and Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Acquire the details of abstractness of mathematics.
CO2	Learn matrix algebra, vector spaces, eigen values, eigen vectors and basic concepts of number theory.
CO3	Understand the fundamental properties of real numbers that lead to the formal development of Real Analysis.
CO4	Recognize technical terms and appreciate some of the uses of tools of algebra.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I

COURSE CODE: BHMH -103

COURSE TITLE: Physics-I Optics

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

MAXIMUM MARKS: 50

TIME: 3Hours **(THEORY: 37**

MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. There will be five sections.
2. Section A carries 9 marks and is compulsory consisting of 8 short answer type questions of 1.5 mark each covering the whole syllabus. The candidates will have to attempt six questions in Section A.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.
4. Scientific calculator is allowed.

COURSE OBJECTIVES:

- To gain theoretical knowledge and an in depth understanding of properties of light like reflection, refraction, interference, diffraction and polarization and their subsequent applications in the design and working of different optical instruments used in various fields of science.

COURSE CONTENT:

UNIT-I

1. Interference of Light **11Hrs**

Superposition of light waves and interference, young's double slit experiment, Distribution of intensity in young's double slit experiment, Conditions for sustained interference pattern, Coherent sources of light, Temporal and spatial coherence, coherence, Interference pattern by division of wave front, Fresnel Biprism, Fresnel double mirror, Llyod's single mirror, Displacement of fringes

UNIT-II

2. Interference by Division of Amplitude **11Hrs**

Change of phase on reflection, Interference in thin films due to reflected and transmitted light, Need for extended source for interference by division of amplitude, Fringes of equal inclination and equal thickness , non reflecting films, Newton's Rings, Michelson Interferometer, Fabry Perot interferometer, Distribution of intensity in Fabry Perot fringes.

UNIT-III

3. Diffraction: **11Hrs**

Huygen's fresnel theory, half-period zones, Zone plate, Distinction between fresnel and fraunhoffer diffraction. Fraunhoffer diffraction at rectangular and circular apertures, Effect of

diffraction in optical imaging, Resolving power of telescope in diffraction grating, its use as a spectroscopic element and its resolving power, Resolving power of microscope. Resolving power of fabry-perot interferometer.

UNIT-IV

4. Polarization: 12Hrs

Transverse nature of light, Plane Polarized light, Elliptically polarized light, wire grid polarizer, Sheet polarizer, Malus Law, Brewester Law, Polarization by reflection, Scattering, Double reflection, Nicol prism, Retardation plates, Production Analysis of polarized light, Quarter and half wave plates. Optical activity, specific rotation, half shade polarimeter.

BOOKS PRESCRIBED:

1. Fundamentals of Optics, F.A. Jenkins and Harvey E White,(Mcgraw Hill) 4th edition,
2. Optics; V.K. Sharma and T.S. Bhatia, S.Vikas and Co.
3. Optics, Ajoy Ghatak,(McMillan Indian) 2nd edition, 7th reprint, 1997
4. Introduction to Atomic Spectra, H.E. White (Mcgraw Hill, Book Co., Inc., New York)
5. Laser Fundamentals, W.T. Silfvast (Foundation Books), New Delhi, 1996
6. Laser and Non-Liner Optics, B.B. Laud (New Age Pub.) 2002
7. Optics, Born and Wolf, (Pergamon Press) 3rd edition, 1965
8. Laser, Svelto, (Plenum Pres) 3rd edition, New York.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Gain knowledge about wave theory of light.
CO2	Acquire in depth understanding on the properties of light like reflection, refraction, interference, diffraction and polarization.
CO3	Understand the applications of interference in design and working of interferometers.
CO4	Comprehend the concept of polarization through understanding of electro- magnetic waves and their transverse nature.
CO5	Understand the applications of diffraction and polarization in various optical instruments.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAME: B.Sc. Hons. (Mathematics) SEM-I

COURSE CODE: BHMH-104

COURSE TITLE: Organic Chemistry-I

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3Hours **MAXIMUM MARKS: 50**

MEDIUM: English **(THEORY: 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V

II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.

III Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidates will have to attempt six questions in Section A.

IV Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.

V The students are required to attempt FIVE questions in all, taking ONE compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

- The objective of Organic Chemistry-I course is to enhance the knowledge of students on the topics of Stereochemistry especially in reference to the OPTICAL ISOMERISM.
- The course is also targeted to increase the knowledge of students for the various methods of preparation and properties of Alkanes, Alkenes, Alkynes, arenes, aromaticity and Nucleophilic addition and Substitution reactions

COURSE CONTENT:

UNIT-I **10Hrs**

Stereochemistry: Molecular chirality, enantiomers/symmetry in achiaral structures, chiral centresin chiral molecules, properties of chiral molecules-optical activity, absolute and relative configuration, the Cahn-IngoldPerlog R-S notional system physical properties of enantiomers. Stereochemistry of chemical reactions that produce chiral centres, chemical reactions that produce stereoisomers, Resolution of enantiomers, chiral centres other than carbon.

UNIT-II **12Hrs**

Chemistry alkanes and alkenes: Conformations of alkanes and cycloalkanes: Conformational analysis of ethane, butane, cyclohexane, monosubstituted and disubstituted cyclohexane, conformation of small, medium and large ring cycloalkanes and of polycyclic ring systems.Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system, mechanism of hydrogenation of alkenes, stereochemistry of hydrogenation of cycloalkenes,

Dehydration of alcohols and regioselectivity of these reactions. Acid catalysed dehydration of alcohols with complete mechanistic discussion, Mechanism of dehydrohalogenation of alkylhalides (E mechanism), stereoselective and antielimination in E reactions, the E Mechanism, electrophilic addition of hydrogen halides to alkenes its regioselectivity explained on the basis of mechanism, free radical addition of hydrogen bromide to alkenes, acid catalysed hydration of alkene with mechanism stereochemistry of halogen addition to alkenes and its mechanistic explanation. Hypohalous acid addition to alkenes, epoxidation of alkenes.

Alkynes: Acidity of acetylene and terminal alkenes, metal ammonia reduction of alkyne, addition of hydrogen halides and water to alkynes, with detailed discussion of mechanism of these reactions, the diels Alder reaction, orbital symmetry and the diels Adler reaction.

UNIT-III **12Hrs**

Nucleophilic sub stitution and addition reaction:

(a) Functional group transformation by nucleophilicsubstituion, mechanismof nucleophilic substitution (SN1/SN2), stereochemistry of SN1/SN2 reactions, steric effect in SN2 reactions, nucleophiles and nucleophilicity, carbocation stability and the rate of substitution, by the SN1 mechanism, stereochemistry of SN1 reactions, carbocation rearrangements in SN1 reactions, solvent effects, substitution and elimination as competing reactions.

(b) Principles of nucleophillic addition to carbonyl groups : Hydration acetal formation, cyanohydrin formation ; reactions with primary and secondary amines, Wittig reaction, steroselective addition to carbonyl groups mechanism of halogenation, acid and base catalysedcholization, haloform reaction, aldol condensation, conjugate nucleophillic addition to unsaturated carbonyl compounds

UNIT-IV **11Hrs**

Arenes and Aromaticity

Nomenclature of benzene derivatives.The aryl group. Aromatic nucleus and side chain.Structure of benzene: Molecular formula and Kekule structure. Stability and carbon carbon bondlengths of benzene, resonance structure, MO picture.Aromaticity : the Huckel's rule, aromatic ions.Aromatic electrophilic substitution–general pattern of the mechanism, role of σ and π complexes.Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel Crafts reaction.Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/pararatio. Side chain reactions of benzene derivatives. Methods of formation and chemicalreactions of alkylbenzenes

BOOKS PRESCRIBED:

1. R.T. Morison and R.N. Boyd, Organic Chemistry.
2. I.L. Finar, Organic Chemistry, Vol. I IV ed.
3. Advanced Organic Chemistry, Reactions Mechanisms and Structure by J. March.
4. Schaum's Outlines Series Theory and Problems of Organic Chemistry by Herbert Meislick and Jacob Sharefkin
5. Problems and their solution in Organic chemistry by I.L. Finar, Modern Organic Chemistry by J.D. Robbert and M.C. Caserio.
6. Organic Chemistry by D.J. Cram and G.S. Hammond.
7. J.E. Banks, Naming Organic Compounds – Programmed Introduction to Organic Chemistry.
8. E.L. Eliel, Stereochemistry of carbon compounds.
9. W. Camp, Organic Spectroscopy.
10. F.A. Carey, Organic Chemistry.

Academic Session 2021-22

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn about SN1, SN2 and SNi Mechanism and the related stereochemistry.
CO2	Understand the concept, principle and applications of UV, IR and NMR Spectroscopy and the problems pertaining to the structure elucidation of simple organic compounds.
CO3	Solve the elimination reaction problems
CO4	Distinguish between type of addition, elimination and substitution reaction.
CO5	Learn E and Z nomenclature , Stereo chemical principle, enantiomeric relationship between R and S

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. (Hons.) Mathematics/Physics/Chemistry SEM-I
COURSE CODE: BHMH-105
COURSE TITLE: COMMUNICATIVE ENGLISH

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3 Hours **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. Practical Question on Paragraph Writing with internal choice as prescribed in *The Written Word* **(8 marks)**
2. Short answer type questions from Unit 1 and 2 of *Making Connections : A Strategic Approach To Academic Reading* **(12 marks)**
3. Essay type question with internal choice from Unit 1 and 2 of *Making Connections: A strategic Approach to Academic Reading* **(8 marks)**
4. Practical question on Letter Writing from *The Written Word* **(5 marks)**
5. The question will carry 08 words out of 30 prescribed words from the "Word List" in *The Written Word.* The student will attempt any four (4) out of the eight (08). **(4X1= 4 marks)**

COURSE OBJECTIVES:

- To build awarenessof self and society by adopting an inter-disciplinary approach to the language.
- To read, interpret and analyse the given texts of English.
- To train students to become competent,committed and creative user of English language.
- To develop their skills to write flawless English.

COURSE CONTENT:

1. Reading and Comprehension Skills:
Students will be required to read and comprehend the essays in Unit 1 and 2 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition. They will be required to answer the questions given after each essay.

2. Developing Vocabulary and using it in the Right Context:
The students will be required to give meaning of the words from the "Word List" from the Chapter "Vocabulary" in the book *The Written Word* .The question will be set from the following words :

Acute, Arrogant, Apathy, Bliss, Brevity, Cease, Chronic, Dearth, Discontent, Effigy, Fastidious, Giddy, Hamper, Guile, Inauspicious, Juxtapose, Kinetic, Laudable, Meticulous, Mundane, Naive, Opaque, Peevish, Proficient, Prolific, Remedial, Strife, Verbose, Woe, Zenith.

Academic Session 2021-22

3. Writing Skills

Students will be required to write a Paragraph and a Letter as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

COURSE OUTCOME:

Sr. No.	On completing the course, the students will be able to:
CO1	Become effective communicators in English language and get better employment opportunities at global level.
CO2	Enhance their confidence level and develop their overall personality.
CO3	Become familiar with socio-political and cultural issues through the recommended text.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. (Hons. – Physics, Chemistry, Mathematics),
B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC/ B.Voc.(Software Development, **Theatre and Stage Craft, Food Processing,**
Textile Design & Apparel Technology)
SEMESTER-I
COURSE CODE: BHMH 106 A
COURSE TITLE: lwzmI pMjwbI

kRYift pRqI hPqw : 04
ku`l GMty : 60
ku`l AMk : 50
iQaUrI AMk : 37
ieMtrnl

smW : 3 GMty
AsY~smYNt : 13

AMk-vMf Aqy pRIiKAk leI hdwieqW

1. islybs dy cwr Bwg hn pr pRSn-p`qr dy pMj Bwg hoxgy[
2. pihly cwr BwgW ivc 02-02 pRSn pu`Cy jwxgy[hryk Bwg ivcoN 01-01 pRSn krnw lwzmI hovygw[hryk pRSn dy brwbr (08) AMk hoxgy[
3. pRSn p`qr dy pMjvyN Bwg ivc swry islybs ivcoN 01-01 AMk dy Cy pRSn pu`Cy jwxgy, ijnHW ivcoN 05 pRSnW dy au~qr dyxw lwzmI hovygw[
4. pypr sY~t krn vwlw jykr cwhy qW pRSnW dI vMf A`goN v`D qoN v`D cwr aup-pRSnW ivc kr skdw hY[

not : ieMtrnl AsY~smYNt 13 AMkW dI hY, jo kwlj v`loN inrDwirq idSw inrdySW Anuswr iQaUrI AMkW qoN v`KrI hovygI[ies pypr dy ku`l AMk 37+13 = 50 hn[

kors dw audyS COURSE OBJECTIVES:

- ividAwrQIAW ivc swihqk rucIAW pYdw krnw[
- Awlocnwqmk r¨cIAW ivksq krnw[
- mwq BwSw dI smJ ƒ ivksq krnw

pwT-kRm

Chairperson, BoS in Mathematics

Academic Session 2021-22

Bwg-pihlw

swihq dy rMg (Bwg pihlw -kivqw Aqy khwxI)
fw. mihl isMG (sMpw.), rvI swihq pRkwSn, AMimRqsr[
(lyKk dw jIvn Aqy rcnw/swr/ivSw-vsqU)

Bwg-dUjw

ieiqhwisk XwdW
s. s. Amol (sMpw.), pMjwbI swihq pRkwSn, AMimRqsr[
(inbMD 1 qoN 6 qk swr/ ivSw-vsqU/SYlI)

Bwg-qIjw

(a) pYrHw rcnw (iqMnW ivcoN ie`k)
(A) pYrHw pVH ky pRSnW dy au¤qr

Bwg-cOQw

(a) BwSw vMngIAW : BwSw dw tkswlI rUp, BwSw Aqy aup-BwSw ivclw AMqr, pMjwbI
aup-BwSwvW dy pCwx-icMnH
(A) pMjwbI BwSw – inkws qy ivkws

pwT-kRm nqIjy COURSE OUTCOMES :

- ividAwrQI dI swihqk soc-smJ ivksq hovygI[
- aus ivc swihq rucIAW ivksq hoxgIAW[
- aus ivc swihq isrjxw dI sµBwvnw vDygI[
- auh iksy vI ivSy dw gihn AiDAYn krn dy kwbl hovygw[
- auh mwq BwSw dy ivkws ivc ivSys Xogdwn pwauxgy[

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College) Syllabus for

PROGRAMME: B.Sc. (Hons. – Physics, Chemistry, Mathematics), B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC/ B.Voc.(Software Development, Theatre and Stage Craft, Food Processing, Textile Design & Apparel Technology)

SEMESTER-I

COURSE CODE: BHMH 106 B

COURSE TITLE : mu`FlI pMjwbI

(In Lieu of Compulsory Punjabi)

kRYift pRqI hPqw : 04
ku`l GMty : 60
ku`l AMk : 50
iQaUrI AMk : 37
ieMtrnl

smW : 3 GMty
AsY~smYNt : 13

AMk-vMf Aqy pRIiKAk leI hdwieqW

1. pihly Bwg ivcoN cwr vrxnwqmk pRSn pu`Cy jwx ijnHW ivcoN iqMn pRSnW dw au~qr dyxw lwjæmI hY[hr pRSn dy cwr-cwr AMk hn[(3x4)=12 AMk
2. Bwg dUsrw ivcoN do-do AMk dy pMj pRSn pu`Cy jwx[swry pRSn lwjæmI hn[(5x2)=10 AMk
3. Bwg qIsrw ivcoN iqMn pRSn pu`Cy jwx ijnHW ivcoN do pRSn h`l krny lwzmI hn[ienHW dy pMj-pMj AMk hn[(2x5)=10 AMk
4. Bwg cOQw ivc pMj ASu`D SbdW nUM Su`D krky ilKxw hovygw[(5x1)=05 AMk

not: ieMtrnl AsY~smYNt 13 AMkW dI hY, jo kwlj v`loN

Chairperson, BoS in Mathematics

Academic Session 2021-22

inrDwirq idSw inrdySW Anuswr ienHW AMkW qoN v`KrI hovygI[ies pypr dy kul AMk 37+13 = 50 hn[

kors dw audyS COURSE OBJECTIVES:

- ividAwrQI nUM Su`D pMjwbI pVHnw-ilKxw isKwauxw[
- pMjwbI BwSw dIAW ivAwkrnk bwrIkIAW qoN jwxU krwauxw[
- Su`D sMcwr nUM ivksq krnw[

pwT-kRm

Bwg-pihlw

pMjwbI BwSw qy gurmuKI ilpI :

(a) nwmkrx qy sMKyp jwx-pCwx : gurmuKI vrxmwlw, A`Kr kRm, svr vwhk (a, A, e),
lgW-mwqrW, pYr ivc ibMdI vwly vrx, pYr ivc pYx vwly vrx, ibMdI, it`pI, A`Dk

(A) isKlweI qy AiBAws

Bwg-dUjw

gurmuKI AwrQogrwPI Aqy aucwrn :

svr, ivAMjn : mu`FlI jwx-pCwx Aqy aucwrx, muhwrnI, lg- mwqrW dI pCwx

Bwg-qIjw

pMjwbI Sbd-joV :

mukqw (do A`KrW vwly Sbd, iqMn A`KrW vwly Sbd), ishwrI vwly Sbd, ibhwrI vwly Sbd, AONkV vwly Sbd, dulYNkV vwly Sbd, lW vwly Sbd, dulwvW vwly Sbd, hoVy vwly Sbd, knOVy vwly Sbd, lgwKr (ibMdI, it`pI, A`Dk) vwly Sbd

Bwg-cOQw

Suæ`D-ASu`D Sbd

pwT-kRm nqIjy COURSE OUTCOMES :

- ividAwrQI pMjwbI BwSw Aqy gurmuKI ilpI dI isKlweI ivc muhwrq hwisl krngy[
- pMjwbI BwSw ivc muhwrnI, lgW-mwqrW, svr Aqy ivAMjn dI pCwx Aqy vrqoN duAwrw aunHW dI smJ nUM ivkisq hovygI[
- pMjwbI Sbd-joVW dI jwxkwrI hwisl krky auh Su`D pMjwbI ilKx-pVHn dy smr`Q hoxgy[
- auh pMjwbI BwSw dy ivAwkrn pRbMD dI jwxkwrI hwisl krngy[

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: BHMH-107
COURSE TITLE: Physics Lab-I (Optics Lab)

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 30
TIME: 3 hours **(PRACTICAL: 22**
MEDIUM: English **INTERNAL ASSESSMENT: 8)**

INSTRUCTIONS FOR PAPER SETTERS:

I. The distribution of marks is as follows: **Max. Marks: 22+08 (Internal Assessment)**
i) One experiment **10 Marks**
ii) Brief Theory **4 Marks**
iii) Viva–Voce **4 Marks**
iv) Record (Practical file) **4 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.

COURSE OBJECTIVES:

- To acquaint and make the students understand the working principles of different optical instruments and relate them to the theoretical concepts of Interference, diffraction and polarization.
- Gain precision in handling of optical instruments and in making accurate physical measurements using experimental uncertainty and limits.

COURSE CONTENT:

1. To find the angle of prism by rotating telescope.
2. To find the refractive index of the glass prism using a spectrometer.
3. To find the refractive index of a transparent liquid using a hollow glass prism and spectrometer for given wavelength.
4. To study the variation of refractive index with wavelength of spectral line of mercury source and hence find the values of Cauchy‟s constant.
5. To measure the wavelength of sodium light by using Newton‟s rings apparatus.
6. To determine the wavelength of spectral line of mercury using diffraction grating.
7. To determine the wavelength of sodium light using plane diffraction grating.
8. To determine the resolving power of plane diffraction grating.
9. To measure an accessible distance between two points using a sextant.
10. To measure an inaccessible distance between two points using a sextant.

Academic Session 2021-22

11. To determine the wavelength of He-Ne laser using plane diffraction grating.
12. To find the specific rotation of sugar solution by Laurentz half shade polarimeter

BOOKS PRESCRIBED:

1. Practical Physics Vol. II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

2. Practical Physics, C.L. Arora, S. Chand & Co

COURSE LEARNING OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the working of basic optical instruments.
CO2	Understand and differentiate between the different phenomenon related to light such as Interference, diffraction and polarization.
CO3	Gain precision in handling of optical instruments.
CO4	Understand the operating principle of certain optical instruments
CO5	Understand the applications of Interference, diffraction and polarization.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: BHMH-108
COURSE TITLE: Organic Chemistry Practical-I

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 30
TIME: 3Hours **(PRACTICAL: 22**
MEDIUM: English **INTERNAL ASSESSMENT: 8)**

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will give one organic salt to the students.
II. Each student will get different salt and analyse it for elements, functional group and prepare its derivatives.
III. The question paper split will be as under:
(Write up = 7, Performance = 7, Viva-voce = 5, Practical note book = 3)

COURSE OBJECTIVES:

- In organic chemistry practical students will learn about the Evaluation of organic compounds for the detection of element, functional group and preparation of their derivatives.
- It includes following functional groups:Acids, ketones, aldehyde, carbohydrates, aromatic hydrocarbons, aromatic amines and phenols.

COURSE CONTENTS:

The preliminary examination of physical and chemical characteristics (physical state, colour,odor and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine),solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test, preparation of derivatives for given pure organic compounds.
The following categories of compounds should be analyzed.
-phenols, carboxylic acids
-carbonyl compounds - ketones, aldehydes
-carbohydrates
-aromatic amines
-aromatic hydrocarbons

BOOKS PRESCRIBED:

Practical Organic Chemistry by F.G. Mann and B.C. Saunders

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Perform functional group analysis
CO2	Prepare derivatives of organic compounds
CO3	Determine physical constant: Melting point, Boiling point.

CO4	Learn different separation techniques.
CO5	Know how to perform TLC

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: BHMH-109
COURSE TITLE: Math Lab-I

CREDIT HOURS (PER WEEK): 3
TOTAL LAB HOURS: 45hrs
MAXIMUM MARKS: 40
TIME: 3Hours **(PRACTICAL: 30**
MEDIUM: English **INTERNAL ASSESSMENT: 10)**

COURSE OBJECTIVES:

- To acquire the knowledge of MATLAB technical computing environment.
- To develop a basic understanding of MATLAB for its usage in higher learning.
- To solve mathematical concepts and sketching of graphs in fraction of seconds. convert the theoretical concepts in matrices to algorithms in MATLAB for their applications in real life.

COURSE CONTENT:

List of Practical's (using any software):-

(a) Operations on matrices using Matlab:

1. Addition of matrices
2. Subtraction of matrices
3. Multiplication of matrices
4. Inverse of matrices
5. Determinants of matrices
6. Eigen values and Eigen vectors of matrices
7. Rank of matrices

(b) Plotting of graphs of function e^{ax+b} , log (ax + b), 1/(ax + b), sin(ax + b), cos(ax + b), |ax + b| and to illustrate the effect of a and b on the graph.

(c) Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.

(d) Sketching parametric curves (e.g. Parabola, ellipse, hyperbola).

BOOKS PRESCRIBED:

1. Thomas, George B., and Finney Ross L. Calculus. Pearson Education, 9th Ed, 2010.
2. Strauss, M.J., and G.L. Bradley and K. J. Smith. Calculus. Delhi: Dorling Kindersley (India) P. Ltd. (Pearson Education), 3rd Ed, 2007.
3. Anton, H., and I. Bivens, and S. Davis. Calculus. Singapore: John Wiley and Sons (Asia) P. Ltd., 7th Ed. 2002.
4. Courant, R., and F. John. Introduction to Calculus and Analysis. New York: Springer-Verlag (Volumes I & II), 1989.

Academic Session 2021-22

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Develop a basic understanding of MATLAB for its usage in higher learning.
CO2	Have a precise direction from theoretical learning to computational techniques
CO3	Solve mathematical concepts and sketching of graphs in fraction of seconds.
CO4	Convert the theoretical concepts in matrices to algorithms in MATLAB for their applications in real life.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: DA1
COURSE TITLE: Drug Abuse Problem, Management and Prevention
PROBLEM OF DRUG ABUSE
(Compulsory for all Under Graduate Classes)

CREDIT HOURS (PER WEEK): 1.5 hrs
TIME: 3Hours **TOTAL HOURS: 22.5 hrs**
MEDIUM: Enlish/Punjabi/Hindi **MAXIMUM MARKS: 50**

INSTRUCTIONS FOR PAPER SETTERS:

Section–A: (15 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying 05 marks. Answer to any of the questions should not exceed two pages.

Section–B: (20 Marks) It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying 10 marks. Answer to any of the questions should not exceed four pages.

Section–C: (15 Marks) It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

COURSE OBJECTIVES: The course aims to:

- Generate the awareness against drug abuse.
- Describe a variety of models and theories of addiction and other problems related to substance abuse.
- Describe the behavioral, psychological, physical health and social impact of psychoactive substances.
- Provide culturally relevant formal and informal education programs that raise awareness and support for substance abuse prevention and the recovery process.
- Describe factors that increase likelihood for an individual, community or group to be at risk of substance use disorders.

COURSE CONTENT:

UNIT–I

- **Meaning of Drug Abuse**

Academic Session 2021-22

Meaning, Nature and Extent of Drug Abuse in India and Punjab.

UNIT-II

- **Consequences of Drug Abuse for:**

Individual : Education, Employment, Income.
Family : Violence.
Society : Crime.
Nation : Law and Order problem.

UNIT-III

- **Management of Drug Abuse**

Medical Management: Medication for treatment and to reduce withdrawal effects.

UNIT-IV

- Psychiatric Management: Counseling, Behavioral and Cognitive therapy.
- Social Management: Family, Group therapy and Environmental Intervention.

References:

1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications. 23
4. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse-Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-6-5, (2018).
5. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-8-9, (2019).
6. Jasjit Kaur Randhawa & Samreet Randhawa, "fr~gj durvrqoN-(nSwKorI) sm~isAw,pRbMDn Aqy rokQwm", KLS, ISBN No. 978-81-936570-7-1, (2018).
7. Jasjit Kaur Randhawa, "Drug Abuse –Management & Prevention", KLS, ISBN No. 978-93- 81278-80-2, (2018).
8. Kapoor. T. (1985) Drug epidemic among Indian Youth, New Delhi: Mittal Pub.
9. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
10. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
11. Rama Gandotra & Jasjit Kaur Randhawa, "fr~gj durvrqoN-(nSwKorI) sm~isAw,pRbMDn Aqy rokQwm", KLS, ISBN No. 978-93-81278-87-1, (2018).
12. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
13. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar: Guru Nanak Dev University.
14. Singh, Chandra Paul 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.

Academic Session 2021-22

15. Sussman, S and Ames, S.L. (2008). Drug Abuse: Concepts, Prevention and Cessation, Cambridge University Press.

16. World Drug Report 2010, United Nations office of Drug and Crime.

17. World Drug Report 2011, United Nations office of Drug and Crime.

COURSE OUTCOMES:

Sr. No.	On completion of this course, the students will be able to:
CO-1.	Get information about a variety of models and theories of addiction and other problems related to substance abuse.
CO-2.	Learn about effects of the use of psychoactive substances on social, behavioural, psychological & physical health of a person
CO-3.	Have knowledge about risk for psychoactive substance use disorder.
CO-4.	Understand the factors that increase the likelihood for an individual, community or group to be at risk.
CO-5.	Understand principles and philosophy of prevention treatment and recovery

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons.

(Mathematics) Sem-II

COURSE CODE: BHMH-201

COURSE TITLE: Calculus-II

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3Hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III & IV respectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- This course introduces the concept of partial derivatives which are used in fields such as computer graphics, physical sciences, vector calculus and engineering.
- Students will evaluate double and triple integrals of functions of several variables.
- Students will apply them in evaluating area and volume of solids.
- This course covers the concepts of jacobians, maxima and minima of functions of two variables, envelopes and evolutes.

COURSE CONTENT:

Unit-I

Definite integrals and their properties, Integration of Hyperbolic functions, Reduction Formulae, Quadrature, Rectification.

Unit-II

Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Statements of Inverse and implicit function theorems and applications, Jacobians.

Unit-III

Envelopes, Evolutes, Maxima, Minima and Saddle points of functions of two Variables, Lagrange's undetermined multiplier method.

Unit-IV

Double and Triple integrals, Change of variables, Change of order of integration, applications in finding Areas and volumes.

Academic Session 2021-22

BOOKS PRESCRIBED:

1. G.B. Thomas and R.L. Finey, Calculus, 9th Ed, Pearson Education, Delhi, 2005.
2. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.
3. Shanti Narayan and P.K. Mittal: Integral Calculus, S. Chand and Co.
4. M.J. Strauss, G.L. Bradley and K.J. Smith, Calculus, 3rd Ed, Dorling Kindersley(India) P. Ltd. (Pearson Education), Delhi, 2007.
5. A text Book of Calculus: S.C.Arora and Ramesh Kumar, Pitamber Publishing Co.

COURSE OUTCOME:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the concept of theory and applications of integrals.
CO2	Find the area of a region, volume of solids with known cross section, average value of a function, centre of gravity, mass and momentum of bodies.
CO3	Get familiar with the properties and geometric interpretation of definite integrals,

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHMH- 202
COURSE TITLE: Algebra-II

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs

TIME: 3Hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III & IV respectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- This course will help the students to understand the relation of roots and coefficients of polynomials.
- Students will learn the methods of solving cubic and biquadratic equations and Descarte's rule of signs.
- Students will be able to solve the problems based on consistency and inconsistency of linear equations.

COURSE CONTENT:

Unit-I

Introduction to Demoivre's theorem and its applications, Exponential and Logarithmic function of complex numbers.

Unit-II

Expansion of trigonometric functions, Circular and hyperbolic functions and their inverses, Gregory's series, Summation of series.

Unit-III

Relation between the roots and coefficients of general polynomial equation in one variable. Transformation of equations and symmetric function of roots.

Unit-IV

Descarte's rule of signs, Newton's Method of divisors, Solution of cubic equations by Cardon's method, solution of biquadratic equations by Descarte's and Ferrari's Methods.

BOOKS PRESCRIBED:

1. K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002).
2. H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.
3. Shanti Narayan and P.K. Mittal: A Text Book of Matrices, S.Chand and Co.

Academic Session 2021-22

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the abstract ideas and learn matrix algebra, vector spaces, eigen values and eigen vectors.
CO2	Recognize consistency and inconsistency of linear equations.
CO3	Understand the fundamental properties of real numbers that lead to the formal development of Real Analysis.
CO4	Apply the abstractness of Algebra .

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHMH 203: Physics-II
COURSE TITLE: Modern Physics

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
TIME: 3Hours **MAXIMUM MARKS: 50**
MEDIUM: English **(THEORY: 37**
INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

1. There will be five sections.

2. Section A carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidates have to attempt six questions in section A.

3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt at one question from each of these sections.

4. Scientific calculator is allowed.

COURSE OBJECTIVES:

- To attain a comprehensive understanding of the fundamental aspects of modern physics.
- Understand the basic ideas of quantum Physics through concepts and theories of 20^{th} century such as of Blackbody radiation, Photoelectric effect, Compton effect, uncertainty principle.
- The discovery of radioactivity, its applications and detailed knowledge and classification of elementary and composite matter particles that exist in universe.

COURSE CONTENT:

UNIT-I **12Hrs**

1. Dual Nature of Matter and Radiation: De Brogile's hypothesis, photoelectric effect, Compton effect, electron diffraction experiments of Davisson and Germer, Wave group and particle velocities, Heisenberg's uncertainty principle, principle of the electron microscope, Diffraction of X-rays from crystals, Planck"s quantum hypothesis, Bragg's law of determination of structure of simple crystals.

UNIT-II **11Hrs**

2. Radioisotopes and their Application: Radioactive decay laws, Uranium and Carbon dating, introduction to α, β and γ decays, Radioisotopes and their production, mass spectrograph, uses of radioisotopes in medicine, agriculture and geology Radiation doses and their units, Biological effects of radiation.

Academic Session 2021-22

UNIT-III **11Hrs**

3. Particle detectors: Uses of ionization chamber, Proportional counter, GM Counter, Scintillation counter and photographic emulsions as detectors.

UNIT-IV **11Hrs**

4. Elementary Particles: Types of interaction, Classification of elementary particles and their properties, Quantum numbers and conservation laws, isospin, charge conjugation, Antiparticles, Introduction to Quarks. Origin and general characterization of cosmic rays (Primary and Secondary)

BOOKS PRESCRIBED:

1. Concepts of Modern Physics: A. Beiser.
2. Essentials of Modern Physics: V. Acota and C. L. Grown
3. Fundamentals of Modern Physics: B. D. Duggal and C. L. Chhabra.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Attain comprehensive knowledge and understanding of the main Physical concepts and theories of the 20^{th} century.
CO2	Understand the basics of crystallography and X-ray diffraction.
CO3	Understand the basic ideas of Quantum Physics through concepts of radiation, photoelectric effect, compton effect, uncertainty principle and concept of wave packet.
CO4	Gain an in depth understanding about the process of Radioactivity and its biological effects and applications.
CO5	Understand the concepts related to particle Physics and attain knowledge about the classification and properties of different particles.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHMH-204
COURSE TITLE: INORGANIC CHEMISTRY-II

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3 hours **(THEORY: 37**
MEDIUM: ENGLISH **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of nine questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section I.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

- Students will learn naming of coordination complexes, Factors affecting co-ordination numbers and stereo-chemistry.
- The objective of the course is to teach the various theories dealing with the bonding in co-ordination compounds like VBT theory, CFT and MOT theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.charge transfer transitions, π-Acid Ligands, and Alkali metal and alkaline earth metal chelators

COURSE CONTENT:

UNIT-I **12Hrs**

Co-ordination Chemistry: Introduction, Werner‟s coordination theory, naming of coordinate complexes. Co-ordination numbers 1-12 and their stereo-chemistries.Factors affecting co-ordination numbers and stereo-chemistry
(a) Configurational Isomers
(b) Conformational isomerism, VSPER theory, molecular orbital theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.
Bonding in metal complexes: Valence bond theory for co-ordinate complexes, inner and outerorbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory.
Stability of coordination compounds: Introduction, Stability constant, stepwise stability

constant,overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle.

UNIT-II 12Hrs

Crystal field theory: Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fieldsof ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting (Jahn-Teller distortion, variation of Ionic radii with increase in atomic number). Thermodynamics effects of C.F. splitting, variation in lattice energies, Hydration energies, Dissociation energies, Formation constants of hexammines. Site selection in spinels, Paramagnetism, diamagnetism, ferro and antiferromagnetism. Microstates and spectroscopic terms, a calculation of spectroscopic terms ford1 electronic configurations, L S coupling, Hund‟s rule for finding the ground state terms,Electronic spectral properties of Ist transition series, Orgel Diagrams for d1 – d10 systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T

UNIT-III 11Hrs

Molecular Orbital Theory: Evidence for covalent character in Bonding, MOEL diagram foroctahedral and tetrahedral complexes involving bonding, charge transfer transitions.
π Acid Ligands: Definition Carbon monoxide complexes, bonding in linear MCO groups,polynuclear metal carbonyls, vibrational spectra, Reactions, carbonyl hydrides and halides. Metal-metal bonding metal-metal multiple bonding , isolable analogies, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters.

UNIT-IV 10Hrs

Alkali metal and alkaline earth metal chelators: Macrocyclic ligands, macrocyclic effect, crownethers and podands, coronands, cryptands, structure of 18 crown-6 complex with KNCS, ion cavity complex, effect of anion and cation type on complex structure, simultaneous complexation of metal ion and water or of two metal ions, sandwich formation, cryptands and their cation complexes, podands with aromatic donors and groups.

BOOKS PRESCRIBED:

1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
3. B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.
4. R. Hilgenfeld and W. Saengar, Topics in current chemistry Vol-II.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn about the coordination compounds and their nature of bonding,
CO2	Gain knowledge to apply ligand field theory CFT on simple molecules.
CO3	Learn about molecular orbital theory
CO4	Learn about VSEPR theory, VBT
CO5	Understand HSAB principle, Orgel diagram, Macrocyclic ligands

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. (Hons.) Maths/ Phy./Chem. SEM-II
COURSE CODE: BHMH 205
COURSE TITLE: COMMUNICATIVE ENGLISH
CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3 hours **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTER:

1. Practical Question on Essay Writing with internal choice as prescribed in The WrittenWord. **(8 marks)**
2. Short answer type questions from Unit 3 and 4 of Making Connections : A Strategic Approach To Academic Reading **(12 marks)**
3. Essay type question with internal choice from Unit 3 and 4 of Making Connections: A strategic Approach to Academic Reading **(8 marks)**
4. Practical Question on Report Writing from The Written Word **(5 marks)**
5. The question will carry 4 Prefixes and 4 Suffixes (from the list given above) from the book The Written Word. The students will attempt any four (4) out of eight (8) **(4 marks)**

COURSE OBJECTIVES:

- To build awarenessof self and society by adopting an inter-disciplinary approach to the language.
- To read, interpret and analyse the given texts of English.
- To train students to become competent, committed and creative user of English language.
- To develop their skills to write flawless English.

COURSE CONTENT:

1. Reading and Comprehension Skills:
Students will be required to read and comprehend the essays in Unit 3 and 4 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Third Edition. They will be required to answer the questions given after each essay.
2. Developing Vocabulary and using it in the right context :
Students will be required to study "prefix" and "suffix" from the chapter "vocabulary" in the book *The Written Word.* The question will be set from the following words :
Prefixes :- a-, anti-, auto-, bi-, dia-, di-, dis-, homo-, Hyper-, hypo-, mis-, non-, semi-, un-, pre-
Suffixes :- -able, -al, -cy, -dom, -fy, -hood, -ious, -ist, -ment, -ness, -ship, -some, -y, -logy.
3. Writing Skills
Students will be required to learn Essay writing, Report Writing and Letter Writing as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Become effective communicators in English language

Academic Session 2021-22

CO2	Enhance their confidence level and develop their overall personality.
CO3	Become familiar with socio-political and cultural issues through the recommended text.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons. – Physics, Chemistry, Mathematics), B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC/ B.Voc. (Software Development, Theatre and Stage Craft, Food Processing, Textile Design & Apparel Technology)

SEMESTER-II

COURSE CODE: BHMH 206 A

COURSE TITLE: lwzmI pMjwbI

kRYift pRqI hPqw : 04
ku`l GMty : 60
ku`l AMk : 50
iQaUrI AMk : 37
smW : 3 GMty
ieMtrnl AsY~smYNt : 13

AMk-vMf Aqy pRIiKAk leI hdwieqW

1. islybs dy cwr Bwg hn pr pRSn-p`qr dy pMj Bwg hoxgy[
2. pihly cwr BwgW ivc 02-02 pRSn pu`Cy jwxgy[hryk Bwg ivcoN 01-01 pRSn krnw lwzmI hovygw[
   hryk pRSn dy brwbr (08) AMk hoxgy[
3. pRSn p`qr dy pMjvyN Bwg ivc swry islybs ivcoN 01-01 AMk dy Cy pRSn pu`Cy jwxgy, ijnHW ivcoN 05 pRSnW
   dy au~qr dyxw lwzmI hovygw[
4. pypr sY~t krn vwlw jykr cwhy qW pRSnW dI vMf A`goN v`D qoN v`D cwr aup-pRSnW ivc kr skdw hY[

not: ieMtrnl AsY~smYNt 13 AMkW dI hY, jo kwlj v`loN inrDwirq idSw inrdySW Anuswr ienHW AMkW qoN v`KrI hovygI[ies pypr dy ku`l AMk 37+13 = 50 hn[

kors dw audyS COURSE OBJECTIVES:

- ividAwrQIAW ivc swihqk rucIAW pYdw krnw[
- Awlocnwqmk rucIAW ƒ ivksq krnw[
- BwSweI igAwn ivc vwDw krnw[

pwT-kRm

Bwg-pihlw

swihq dy rMg (Bwg dUjw - vwrqk Aqy ryKw-ic`qr)
fw. mihl isMG (sMpw.), rvI swihq pRkwSn, AMimRqsr[
(iksy lyK Aqy ryKw-ic`qr dw swr/ivSw-vsqU/nwiek ibMb)

Bwg-dUjw

ieiqhwisk XwdW

Chairperson, BoS in Mathematics

Academic Session 2021-22

s. s. Amol (sMpw.), pMjwbI swihq pRkwSn, AMimRqsr[
(inbMD 7 qoN 12 qk swr/ ivSw-vsqU/SYlI)

Bwg-qIjw

(a) Sbd-bxqr Aqy Sbd-rcnw – pirBwSw Aqy mu`Fly sMklp
(A) Sbd-SRyxIAW

Bwg-cOQw

(a) d&qrI ic`TI p`qr
(A) muhwvry Aqy AKwx

pwT-kRm nqIjy Course Outcomes (COs)

- ividAwrQI dI soc-smJ ivksq hovygI[
- aus AMdr swihqk rucIAW pRPil~q hoxgIAW[
- aus AMdr swihq isrjxw dI sµBwvnw vDygI[
- auh sµbµiDq ivSy dw gihn AiDAYn krn dy suXog hovygw[
- auh BwSweI bxqr qoN jwxU hovygw

Chairperson, BoS in Mathematics

Academic Session 2021-22

Khalsa College Amritsar

(Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons. – Physics, Chemistry, Mathematics),B.Sc. BioTech./IT/Fashion Designing/Food Sc./BCA, BA-JMC/B.Voc. (Software Development, Theatre and Stage Craft, Food Processing, Textile Design & Apparel Technology)

SEMESTER-II

COURSE CODE: BHMH 206 B

COURSE TITLE: mu`FlI pMjwbI

(In Lieu of Compulsory Punjabi)

kRYift pRqI
hPqw : 04
ku`l GMty : 60
ku`l AMk : 50
iQaUrI AMk : 37
smW : 3 GMty ieMtrnl AsY~smYNt : 13

AMk-vMf Aqy pRIiKAk leI hdwieqW

1. Bwg pihlW ivcoN cwr pRSn p~uCy jwx ijnHW ivcoN iqMn pRSnW dw au~qr dyxy lwjæmI hn[hr pRSn dy cwr-cwr AMk hn [(3x4)=12 AMk
2. Bwg dUsrw ivcoN do-do AMk dy pMj pRSn pu`Cy jwx[swry pRSn lwjæmI hn[(5x2)=10 AMk
3. Bwg qIsrw ivcoN cwr pRSn pu`Cy jwx ijnHW ivcoN do pRSn h`l krny lwzmI hn[(2x5)=10 AMk
4. Bwg cOQw ivcoN do pRSn pu`Cy jwx ijnHW ivcoN iek pRSn h`l krnw hovygw[(1x5)=05 AMk

not: ieMtrnl AsY~smYNt 13 AMkW dI hY, jo kwlj v`loN inrDwirq idSw inrdySW Anuswr ienHW AMkW qoN v`KrI hovygI[ies pypr dy ku`l AMk 37+13 = 50 hn[

kors dw audyS COURSE OBJECTIVES:

- ividAwrQI AMdr pMjwbI BwSw dI smJ ivksq krnw[
- pMjwbI BwSw dy ivAwkrnk pRbMD sMbMDI igAwn krwauxw[
- isKlweI qy AiBAws duAwrw pMjwbI BwSw 'qy pkV vDwauxw[

pwT-kRm

Bwg-pihlw

pMjwbI Sbd-bxqr :

DwqU, vDyqr (Agyqr, mDyqr, ipCyqr), pMjwbI koSgq Sbd Aqy ivAwkrnk Sbd

Bwg- dUjw

Chairperson, BoS in Mathematics

Academic Session 2021-22

pMjwbI Sbd-pRkwr :

(a) sMXukq Sbd, smwsI Sbd, dojwqI Sbd, dohry/duhrukqI Sbd Aqy imSrq Sbd[

(A) isKlweI qy AiBAws

Bwg-qIjw

pMjwbI Sbd-rcnw :

ie`k-vcn bhu-vcn, ilMg-puilMg, bhuArQk Sbd, smwnArQk Sbd, bhuqy SbdW leI ie`k Sbd, Sbd ju`t, ivroDArQk Sbd, smnwmI Sbd

Bwg-cOQw

in`q vrqoN dI pMjwbI Sbdwvl I :

Kwx-pIx, swkwdwrI, ru`qW, mhIinAW, igxqI, mOsm, bwjæwr, vpwr, DMidAW nwl sMbMiDq

pwT-kRm nqIjy Course Outcomes (COs)

- ividAwrQIAW dI in`q vrqoN dI pMjwbI Sbdwvl I bwry smJ hor ivkisq hovygI[
- auh pMjwbI Sbd-bxqr dI jwxkwrI hwisl krky BwSweI igAwn nUM ivkisq krngy[
- pMjwbI Sbd-rcnw sMbMDI jwxkwrI aunHW dy igAwn ivc vwDw krygI[

Chairperson, BoS in Mathematics

Academic Session 2021-22

Khalsa College Amritsar
(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II
COURSE CODE: BHMH 207
COURSE TITLE: Physics Lab-II

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs.
MAXIMUM MARKS: 30
TIME: 3Hours **(THEORY: 22**
MEDIUM: English **INTERNAL ASSESSMENT: 08)**

INSTRUCTIONS FOR PAPER SETTERS:

The distribution of marks is as follows: **Max. Marks: 22+08 (Internal Assessment)**
i) One experiment **10 Marks**
ii) Brief Theory **4 Marks**
iii) Viva–Voce **4 Marks**
iv) Record (Practical file) **4 Marks**
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.

COURSE OBJECTIVES: To understand the basic concepts of Modern Physics such as particle nature of light, decay of atomic nucleus, atomic and molecular spectra of elements and molecules and knowledge of semiconductor devices through experiments on Photoelectric effect, Geiger Muller counter, analysis of molecular spectrum of iodine and PN junction.

COURSE CONTENT:

1. To study the gas discharge spectrum of hydrogen.
2. To study the absorption spectra of iodine vapours.
3. To determine the ionization potential of mercury.
4. To study the photoelectric effect and determine the value of Planck's constant.
5. To determine the ionization potential of mercury.
6. Study of variation of light intensity with distance using photovoltaic cell (Inverse Square Law).
7. To draw the plateau of a GM counter and find the operating voltage of GM tube.
8. To find the dead time of GM counter.
9. To study the absorption coefficient beta particles in aluminium using GM counter and find the absorption coefficients.
10. To study the statistical fluctuations and end point energy of beta particles using GM counter.
11. Measurement of reverse saturation current in pn junction diode at various temperatures and find the approximate value of the band gap.

Academic Session 2021-22

BOOKS PRESCRIBED :

1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2. Practical Physics, C.L. Arora, S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the basic experiments of Modern Physics.
CO2	Understand and verify the particle nature of light through experiments on Photoelectric effect.
CO3	Gain knowledge about the construction and working of gas filled radiation detectors.
CO4	Understand the concept of molecular spectra.
CO5	Learn the working of a PN junction and comprehend the concept of band gap.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II

COURSE CODE: BHMH-208

COURSE TITLE: Inorganic Chemistry Practical-II

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs.

MAXIMUM MARKS: 30

TIME: 3 hours **(THEORY: 22**

MEDIUM: English **INTERNAL ASSESSMENT: 08)**

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will give one organic salt to the students.
II. Each student will get different salt and analyse it for elements, functional group and prepare its derivatives.
III. The question paper split will be as under:
(Write up = 7, Performance = 7, Viva-voce = 5, Practical note book = 3)

COURSE OBJECTIVE:

- Students learn to identify and separate different cations in the inorganic mixtures through different methods.
- Students will be able to perform special tests for anions.

COURSE CONTENT:

Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain inter38nterfering anions and one, the insoluble.

a) Special Tests for Mixture of Anions

(i) Carbonate in the presence of sulphate.
(ii) Nitrate in the presence of nitrite
(iii) Nitrate in the presence of bromide and iodide.
(iv) Nitrate in the presence of chlorate.
(v) Chloride in the presence of bromide and iodide.
(vi) Chloride in the presence of iodide.
(vii) Bromide and iodide in the presence of each other and of chloride.
(viii) Phosphate, arsenate and arsenite in the presence of each other.
(ix) Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.
(x) Borate in the presence of copper and barium salts.
(xi) Oxalate in the presence of fluoride.

b) Separation and Identification of Cations in Mixtures

(i) Separation of cations in groups.
(ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III,

Group IV, Group V and Group VI cations.

BOOKS PRESCRIBED:

Vogel's bo'k on Inorganic Qualitative Analysis

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Identify the anions present in the mixture.
CO2	Identify the cations present in the mixture.
CO3	Gain hands-on practice of handling different Chemicals in the lab
CO4	Learn to prepare basic solution required to identify cations and anions in the mixture
CO5	Learn about determination of boiling points of various compounds.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II
COURSE CODE: BHMH-209
COURSE TITLE: Math Lab-II

CREDIT HOURS (PER WEEK): 3
TOTAL LAB HOURS: 30 hrs
MAXIMUM MARKS: 40
(PRACTICAL: 30
INTERNAL ASSESSMENT: 10)

TIME: 3 hours
MEDIUM: English

COURSE OBJECTIVES:

- To acquire the knowledge of MATLAB technical computing environment.
- To enable the students to use MATLAB in sketching of 3-dimensional graphs in fraction of seconds
- To help the students to convert the theoretical concepts of integrals to algorithms in MATLAB for their applications in real life.

COURSE CONTENT:

List of Practical's (using any software):-

(a) Trapezoidal rule.
(b) Simpson's 1/3rd and 3/8th rule.
(c) Prismoidal rule.
(d) Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, parabolic, hyperbolic paraboloid using Cartesian coordinates.
(e) Area enclosed by curves.

BOOKS PRESCRIBED:

1. Shastry, S.S. Introductory Methods of Numerical Analysis. New Delhi: PHI Learning Private Limited, 2005. Print.
2. Mathews, John H., and D. Fink Kurtis. Numerical Methods using Matlab, 4th Ed. New Delhi: PHI Learning Private Limited, 2012. Print.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Develop a basic understanding of MATLAB for its usage in higher learning.
CO2	Have a precise direction from theoretical learning to computational techniques.
CO3	Use MATLAB in sketching of 3-dimensional graphs in fraction of seconds
CO4	Convert the theoretical concepts of integrals to algorithms in MATLAB for their applications in real life.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II
COURSE CODE: DA2
COURSE TITLE: DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
(Compulsory for all Under Graduate Classes)

CREDIT HOURS (PER WEEK): 1.5 hrs.
TIME: 3 hours **TOTAL HOURS: 22.5 hrs.**
MEDIUM: Enlish/Punjabi/Hindi **MAXIMUM MARKS: 50**

INSTRUCTIONS FOR PAPER SETTERS:
Section–A: (15 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying 05 marks. Answer to any of the questions should not exceed two pages.
Section–B: (20 Marks) It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying 10 marks. Answer to any of the questions should not exceed four pages.
Section–C: (15 Marks) It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

COURSE OBJECTIVES: The course aim is to

- Describe the role of family in the prevention of drug abuse.
- Describe the role of school and teachers in the prevention of drug abuse.
- Emphasize the role of media and educational and awareness program.
- Provide knowhow about various legislation and Acts against drug abuse.

COURSE CONTENT:

UNIT-I

- **Prevention of Drug abuse**

Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.

UNIT-II

- School: Counseling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Academic Session 2021-22

UNIT-III

- **Controlling Drug Abuse**

Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program

UNIT-IV

- Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trial.

References:

1. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
2. Gandotra, R. and Randhawa, J.K. 2018. fr~gj durvrqoN-(nSwKorI) sm~isAw, pRbMDn Aqy rokQwmw' Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
4. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
5. Randhawa, J.K. and Randhawa, Samreet 2018. Drug Abuse-Management and Prevention. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
6. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
7. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar: Guru Nanak Dev University.
8. Singh, Chandra Paul 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
9. World Drug Report 2011, United Nations office of Drug and Crime.
10. World Drug Report 2010, United Nations office of Drug and Crime

COURSE OUTCOMES:

	On completion of this course, the students will be able to:
CO-1.	Understand the importance of family and its role in drug abuse prevention.
CO-2.	Understand the role of support system especially in Schools and inter-relationships between students, parents & teachers.

Academic Session 2021-22

CO-3.	Understand the impact of Media on substance abuse prevention.
CO-4.	Understand the role of awareness drives, campaigns etc. in Drug abuse management.
CO-5.	Learn about the Legislations and Acts governing Drug trafficking & Abuse in India.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III

COURSE CODE: BHMH-301

COURSE TITLE: Trigonometry and Advanced Calculus

CREDIT HOUR (PER WEEK: 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 75
(THEORY: 56
INTERNAL ASSESSMENT: 19)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B & C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The course will give introduction of the functions of several variables.
- The content of the course is designed to introduce the fundamental tools such as continuity and differentiability of the function of several variables.
- The various concepts of the applicability of the calculus of several variables in real life will be introduced.
- The course introduces derivation and applications of De Moivre's Theorem.

COURSE CONTENT:

Unit-I

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem, Statements of Inverse and implicit function theorems and applications, Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and Saddle points of functions of two Variables, Lagrange's undetermined multiplier method.

Unit-II

Double and Tripple integrals, Change of variables, applications in finding Areas and volumes. De Moivre's theorem and its applications (Excluding nth roots of unity), Exponential and Logarithmic function of complex numbers, Expansion of trigonometric functions, Circular and hyperbolic functions and their inverses, Gregory's series, Summation of series.

Academic Session 2021-22

BOOKS PRESCRIBED:

1. Narayan, S. & Mittal, P.K. : Integral Calculus, S. Chand & Co.
2. Kreyszig, E.: Advanced Engineering Mathematics.
3. Narayan S. & Mittal, P.K. : Differential Calculus, S. Chand & Co.
4. S. N. Loney : Plane Trigonometry part II, Cambridge University press.

COURSE OUTCOMES:

	On completion of this course, the students will be able to:
CO-1.	Learn conceptual variations while advancing from one variable to several variables in calculus.
CO-2.	Learn about the basic principles of multi-variable calculus with proofs.
CO-3.	Understand the maximum and minimum behaviour of a function of two variables.
CO-4.	Understand the concept of partial derivatives, envelopes and evolutes, jacobians, calculate powers and nth roots of complex numbers, solution of algebraic equations using de moivre's theorem**.**

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III

COURSE CODE: BHMH-302

COURSE TITLE: Analysis

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3Hours **MAXIMUM MARKS: 75**

MEDIUM: ENGLISH **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Analysis is the branch of mathematics that studies the behavior of real numbers, sequences and series of real numbers and real functions.
- The content of this course is designed to make the students understand to work comfortably with completeness of real line, to test the convergence of sequences and series of various types and the convergence of improper integrals.
- The content of this course helps to solve Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

COURSE CONTENT:

Unit – I

Real number & its properties. Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral tests. Ratio tests. Cauchy's root test. Raabe's test, Logarithmic test. Demorgan's and Bertrand's tests. Kummer's test, Cauchy Condensation test, Gauss test, Alternating series. Leibnitz's test, absolute and conditional convergence.

Unit-II

Partitions, Upper and lower sums. Upper and lower integrals, Riemann integrability. Conditions of existence of Riemann integrability of continuous functions and of monotone functions. Algebra of integrable functions. Improper integrals and statements of their conditions of

existence. Test of the convergence of improper integral.

BOOKS PRESCRIBED:

1. Malik, S.C & Arora, Savita.: Mathematical Analysis, Wiley Eastern Ltd. (1991).
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974).
3. Narayan, S & M.D. Raisinghania .: Elements of Real Analysis , S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Study the behavior of real numbers, sequences and series of real numbers and real functions.
CO2	Understand how to work comfortably with completeness of R.
CO3	Test the convergence of sequences and series of various types, the convergence of improper integrals.
CO4	Apply analysis in science and engineering in the form of Fourier analysis, wavelets and harmonic analysis.
CO5	Apply the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III

COURSE CODE: BHMH 303

COURSE TITLE: Physics-III electricity and magnetism

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

MAXIMUM MARKS: 50

TIME: 3 hours **(THEORY: 37**

MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. There will be five sections.
2. Section A carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.
4. Scientific calculator is allowed.

COURSE OBJECTIVES:

- It gives an opportunity for the students to learn about one of the fundamental relations of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force.
- To apply the knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
- The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and magnetic materials.
- The course is very useful for the students in almost every branch of science and engineering.

COURSE CONTENT:

UNIT-I

Basic Ideas of Vector Calculus, Introduction to gradient, divergence & curl; their physical significance, Gauss‟s Divergence and Stoke's theorems (Statement only), Electric charge and its properties, Coulomb‟s law. Principle of superposition. The electric field due to a point charge and continuous charge distributions, Electric field due to finite and infinite lines of charges. Field due to electric dipole, Field lines, flux, Gauss‟s law and its applications. Curl of electric field. Relation between potential and electric field. Poisson‟s and Laplace‟s equations. Electric potential due to different charge distribution: Wire, Ring

UNIT-II

Electric Currents and Fields of Moving Charges Conductors in the electrostatic field, Capacitors,

Current and current density, drift velocity, expression for current density vector, Equation of continuity. Ohm‟s Law and expression for electrical conductivity, limitations of Ohm‟s law, Dielectrics, Non Polar and Polar Molecules, Polarisation of Dielectric, Polarization Vector „P‟, Atomic polarizability, Dielectric Constant.

UNIT-III

Magnetic Effect of Electric Current, Direction of Field Lines due to current Flowing in a straight Conductor, Magnetic Field Density, Magnitude of Magnetic Flux, Magnetic and Lorentz Forces, Biot-Savart‟s Law, Magnetic Field Due to along Straight Conductor, Magnetic Field Intensity at point on the axis of a current loop. Variation of Field along the axis of the coil, Magnetic Field intensity inside a long Solenoid, Ampere‟s Circuital Law: Line Integral of Magnetic Field.

UNIT-IV

Some Important Terms associated with Magnetic Materials, Torque on current Loop, Magnetic Dipole in a Magnetic Field , Potential Energy of Magnetic Dipole, Force on Magnetic Dipole In Non-Uniform Magnetic Field, Magnetic Dipole Moment of an Atom, Expression of orbital Magnetic dipole moment of Electron, Electron Spin Magnetic Moment , Diamagnetism , Langevin‟s theory of diamagnetic behaviour, Paramagnetism and Langevin‟s Theory of Paramagnetic Susceptibility, Ferromagnetism, Domain theory of Magnetism,

BOOKS PRESCRIBED:

1. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publishing Co.
2. Introduction to Electrodynamics -D.J. Griffiths, Pearson Prentice Hall, New Delhi.
3. Berkeley Physics Course Vol. II (Electricity & Magnetism)-E.M.Purcell, Mc Graw hill, New York.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the calculus along with physical principles to effectively solve problems encountered in everyday life.
CO2	Learn about electric charges and their interactions, electric field, electric potential, Coulomb's law, Gauss's law and their applications.
CO3	Explain the concept of moving charges, current, capacitors and their energy storage, Ohm's law and polarizability.
CO4	Understand magnetic field due to current and their interactions, Biot-Savart's law, Ampere circuital law and their applications.
CO5	Understand different types of magnetic materials and Langevin's theory of diamagnetism and paramagnetism.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III

COURSE CODE: BHMH-304

COURSE TITLE: PhysicalChemistry-III

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3 hours **TOTAL MARKS: 50**

MEDIUM: English **(MAXIMUM MARKS: 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V

II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.

III. Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section I.

IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.

V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

- The Physical Chemistr-III course enables the students to learn deeply about the states of matter and inculcate the theory for further practical approach.
- Students will learn about the gaseous, liquid states and the colloidal state.
- The mathematical derivations and formulas will provide knowledge of the various analytical properties of gases and liquids.
- The colligative properties and solutions topic is very crucial for exploring the day to day life phenomenon, and also from the perspective of research for solution preparations.
- Some important topics such as emulsions, gels and adsorption are very important for students in daily life.

COURSE CONTENT:

UNIT I

1. Solutions and Colligative Properties 12Hrs.

Ideal and non–ideal solutions, methods of expressing concentrations of solutions, Dilute solution, colligative properties, Raoult‟s law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point.

UNIT-II

2. Surface Chemistry 11 Hrs.

Bulk phases and interfacial region, types of interfaces; Surface tension and interfacial tension. Thermodynamics of surfaces, plane interface, curved interface, Laplace and Kelvin equations,

the contact angle, capillary rise and surface tension. Surface tension of solutions, Gibbs adsorption equation and its derivation from thermodynamic considerations. Surfactants, Surface films on liquids. Criteria for spreading in liquid-liquid systems. (Wetting as contact angle and capitulary action Phenomenon solid liquid systems).

UNIT-III

3. Chemical Kinetics **7 Hrs.**

Rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions, half-lives; determination of reaction order. Temperature dependence of reaction rates, reaction mechanism, rate-determining step approximation, steady-state approximation. Catalysis, homogeneous catalysis, autocatalysis, oscillation reactions. Enzyme catalysis, heterogeneous catalysis.

UNIT-IV

4. Liquid State **10 Hrs.**

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquids crystal, solid andliquid. Classification, structure of nematic and cholestric phases. Thermography and sevensegment cell.

5. Colloidal State **5 Hrs.**

Definition of colloids, classification of colloids. Solids in liquids (Sol): kinetic, optical andelectrical, properties, stability of colloids,protective action, Hardy Schulze law, gold number. Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifiers. General applications of colloids.

BOOKS PRESCRIBED:

1. Physical Chemistry by P.W. Atkins, 8th Ed., Oxford University Press, 2006 (Indian Print).
2. Physical Chemistry by T. Engel & P. Reid, 1st ed., Pearson Education, 2006.
3. Physical Chemistry by Castellan, 3rd Ed., Addison Wisley/Narosa, 1985 (Indian Print)
4. Physical Chemistry by G. M. Barrow, 6th Ed., New York, McGraw Hill, 1996.
5. Physical Chemistry by R. J. Silbey, R. A. Albert &Moungi G. Bawendi, 4th Ed., New York: John Wiley, 2005.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn about ideal and non–ideal solutions, methods of expressing concentrations of solutions, dilute solution, colligative properties and Raoult's law
CO2	Understand rate of reaction, rate constant and rate laws, the order of reaction, first, second , third and zero order reactions
CO3	Learn about homogeneous catalysis, autocatalysis, oscillation reactions, enzyme catalysis and heterogeneous catalysis
CO4	Understand the structure of liquids structural differences between solids, liquids and gases
CO5	Understand the classification of colloids. kinetic, optical and electrical, properties, stability of colloids, protective action, Hardy Schulze law, gold number, types of emulsions, Emulsifiers and applications of colloids.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Biotech., Food Sci., Comp. Sci., Eco., FD., IT., Med., Non Med.)/ B.Sc. (Hons.-Physics, Chemistry, Maths)/B.B.A./B.C.A./B.Com./B.Com. (Hons.)/ BJMC/BA Social Sciences/BA (Hons.) Punjabi, BA (Hons.) English

Sem-III

COURSE CODE: BHMH-305/ESL221

COURSE TITLE: ENVIRONMENTAL STUDIES–I (COMPULSORY)

CREDIT HOURS (PER WEEK): 2

TIME: 3 Hrs **TOTAL HOURS: 30**

MEDIUM: English/Punjabi/Hindi **MAXIMUM MARKS: 50**

INSTRUCTIONS FOR PAPER SETTERS: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each unit of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.

Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.

Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.

COURSE OBJECTIVES:

- The main goal of Environmental studies is to create the environmental awareness to create a safe, green and sustainable environment.
- To make students aware about the importance of ecosystem, types of ecosystem, energy flow in an ecosystem, ecological succession, food chain and food web.
- To make students aware of water conservation, global warming, consumerism and waste products. and, also about the environmental protection acts.
- Role of National Service Scheme (NSS). Health and hygiene.

COURSE CONTENT:

Unit-I

The Multidisciplinary Nature of Environmental Studies:

- Definition, scope & its importance.
- Need for public awareness.

Natural Resources:

- Natural resources and associated problems:

a) Forest Resources: Use of over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

Academic Session 2021-22

b) Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food Resources: World food problems, change caused by agriculture and overgrazing, effects or modern agriculture, fertilizer-pesticide problem, salinity, case studies.

e) Energy Resources: Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.

f) Land Recourses: Land as a resource, land degradation, soil erosion and desertification. Role of an individual in conservation of natural resources.

Equitable use of resources for sustainable lifestyles.

Unit-II

Ecosystem:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystems:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III

Social Issues and Environment:

From unsustainable to sustainable development. Urban problems related to energy.

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocause. Case studies.

Wasteland reclamation. Consumerism and waste products. Environmental Protection Act:

- Air (prevention and Control of Pollution) Act.
- Water (prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.

Issues involved in enforcement of environmental legislation. Public awareness.

Unit-IV

National Service Scheme

- **Introduction and Basic Concepts of NSS:** History, philosophy, aims & objectives of NSS; Emblem, flag, motto, song, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries.
- **Health, Hygiene & Sanitation:** Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health

Programme; Reproductive health.

BOOKS PRESCRIBED:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn about the concept of sustainable environment.
CO2	Gain knowledge on the ecosystem and its functioning.
CO3	Become aware about the water conservation programs like rain water harvesting and water shedding.
CO4	Gain knowledge on environmental (Air, water and pollution) protections acts.
CO5	Know about the role and importance of NSS–a volunteer organization, in making up a better environment and to maintain better health and hygiene.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III
INTERDISCIPLINARY COURSE ID-I
COURSE CODE: BHMH-306
COURSE TITLE: Psychology

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3 hours **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

Section A: - Seven Questions will be set in Section A. Students are required to attempt all the questions in about 50 words. Each question carries 1 mark. **7x1=7 Marks**

Section B: - Eight questions will be set. Students are required to attempt any five out of the eight questions in about 100 words. Each question carries 6 marks. **5x6=30 Marks**

COURSE OBJECTIVES:

- To provide basic knowledge of different psychological and cognitive processes.
- To bring awareness in students regarding their mental processes, behaviors and emotional reactions.
- To teach various coping strategies to deal with stress effectively.
- To enhance communication skills of students.

COURSE CONTENT:

UNIT-I

Personality

a. Brief introduction of theories of Personality (Eysenck, Freud, Erikson and Big Five).

b. Description of Personality tests: EPQ, NEO-PIR, W.A.T.

Stress

a. Definition and Techniques of Stress management.
b. Role of Hardiness in Stress.

Attitudes

a. Definition and components of Attitude.
b. Formation of Attitude and ways to change Attitude.

UNIT-II

Motivation

a. Theories of Motivation (Maslow and Herzberg)
b. Types of Motivation and ways to enhance Motivation

Academic Session 2021-22

Goal Setting

a. Understanding Goal Setting (Locke‟s theory)
b. Goal-Setting Principles

Problem Solving

a. Concept and Stages of Problem Solving.
b. Role of Analytical intelligence in Problem Solving.

UNIT- III

Confidence

a. Defining Confidence (Vealey)
b. Defining and Developing optimistic mind-set

Role of self-efficacy in Confidence (Bandura).

Concentration

a. Understanding Concentration
b. Components, Strategies of Concentration

Communication

a. Definition and Types of Communication.
b. Developing effective Communication skills.

BOOKS PRESCRIBED:

1. Human motivation by David C. McClelland, Cambridge University Press
2. Psychology of Motivation by Denis Waitley, Nova Publishers.
3. Theories of Personality by Jess Feist, Gregory J Feist, Irwin/McGraw-Hill.
4. Attitudes and attitude change by William D. Crano, RadmilaPrislin, Psychology Press.
5. Attitudes amd attitude change by William D. Crano, RadmilaPrish, Psychology Press.
6. Morgan and King: Introduction to Psychology - Tata McGraw Hill.
7. Social Psychology in Sport by Sophia Jowett, David Lavallee, Human Kinetics.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand their thoughts, feelings and behaviors appropriately.
CO2	Cope with stressful situations in an effective manner.
CO3	Verbally and non- verbally expressing themselves productively in interviews

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III

COURSE CODE: BHMH-307

COURSE TITLE: Physics Lab-III

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 45

MAXIMUM MARKS: 50

TIME: 3Hours **(PRACTICAL: 37**

MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

I. The distribution of marks is as follows: **Max. Marks: 37+13(Internal Assessment)**

i) One experiment **15 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10Marks**

iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

COURSE OBJECTIVES:

- The objective of the course is to provide knowledge of various practical'sabout electricity and magnetism and measurements such as Resistance, Voltage, current etc.
- The course provides practical knowledge of various physical phenomena such as magnetism, electromagnetism and semiconductors.
- Students would gain a hands-on learning experience by performing experiments on these properties of materials.
- The students can understand the principles to effectivelysolve problems encountered in everyday life and further study in science.

COURSE CONTENT:

1. To determine low resistance with Carey-Foster"s Bridge after calibrating the bridge wire.

2. To determine low resistance with Carey-Foster"s Bridge without calibrating the bridge wire.

3. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
4. To study the induced e.m.f. as a function of the velocity of the magnet.
5. To determine unknown Capacitance by flashing and quenching of a neon lamp.
6. Determination of permittivity of a air and relative permittivity by measuring capacitance using de–Sauty‟s bridge.
7. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.
8. To study the working of household energy meter.
9. To determine the heating efficiency of an electric kettle with varying input voltages.
10. To study the resonance in series LCR circuit for different R values and calculate Q value.
11. To determine the magnetic dipole moment of a bar magnet and horizontal intensity of earth‟s magnetic field using a deflection magnetometer.
12. To measure the charge sensitivity of a moving coil Ballistic galvanometer using a known capacitor.
13. To measure the magnitude and direction of earth‟s magnetic field using earth inductor.
14. To study the variation of resistance of a filament of a bulb with temperature.

BOOKS PRESCRIBED:

1. Practical Physics, Volume-I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

2. Practical Physics, C. L. Arora, S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand and perform the practical of Carey Foster bridge to find low resistance with and without calibrating it.
CO2	Understand the working of household energy meter.
CO3	Verify the Faraday's law of electromagnetic induction by simple experiment.
CO4	Find the efficiency of an electric kettle with varying input voltages.
CO5	Find the unknown capacitance by using flashing and quenching method. Variation of magnetic field with distance is also be studied.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons) Maths Semester-III
COURSE CODE: BHMH 308
COURSE TITLE: Physical Chemistry Lab-III

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(PRACTICAL: 37
INTERNAL ASSESMENT: 13)

TIME: 3Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will set two questions selecting one from Section-A and one from Section-B.
II. Students will be asked to complete write up of both practical within first 20 minutes on the first sheet provided.
III. On the second sheet provided after 20 minutes, students will perform and note the record on second sheet during the conduct of practical exam
IV. The split of marks will be as under:
(Write up = 12, Performance = 12, Viva-voce = 8, Practical note book = 5)

COURSE OBJECTIVES:

- This practical course enables the students to understand the physical properties of liquids such as surface tension, density and viscosity.
- Students are able to understand the measurement techniques of some of the physical properties.
- Students will learn to handle apparatus like stalagmometer, Ostwald's viscometer and calorimeter.
- Students will be able to understand the acid-base titrations in the laboratory.

COURSE CONTENT:

Crystalisation:

Concept of indication of crystalisation.Phthalic acid from hot water (using fluted filter paper & stem less funnel)
Acetanilide from boiling water.
Naphthalene from Ethanol
Benzoic acid from water

Physical Chemistry

1. To determine the specific reaction rate of hydrolysis of ethyl acetate catalyzed by Hydrogen ions at room temperature.
2. To study the effect of acid strength on hydrolysis of an ester.

Viscosity, Surface Tension (Pure Liquids)

3. To study the viscosity and surface tension of glycerine solution in water.

4. To determine the solubility of benzoic acid at different temperatures and to determine H of the dissolution process.
5. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.
6. To determine the enthalpy of dissolution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

BOOKS PRESCRIBED:

1. Findlay's Practical Physical Chemistry, 9th Edition, Revised by B.P. Levitt
2. Experimental Physical Chemistry by RC DAS and B. Behera 9th Edition,
3. Advance Practical Chemistry, J. B. Yadav

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Measure important physical properties like surface tension, viscosity, density, enthalpy, heat of neutralization etc.
CO2	Learn to examine various physical parameters by different methods
CO3	Learn to handle important apparatus like stalagmometer, Ostwalds viscometer and calorimeter.
CO4	Learn to examine the rate of reactions (hydrolysis of ester)
CO5	Learn to perform acid-base titrations

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV

COURSE CODE: BHMH - 401

COURSE TITLE: Mathematical Modelling and Differential Equations

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3 hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The students will be introduced to various mathematical models like compartmental model, exponential decay model etc.
- The course content is designed to introduce Ordinary differential equations and it's geometrical interpretation.
- The course explains fundamental techniques in solving different mathematical models.
- The course gives detailed information on exact differential equations by finding integrating factors.

COURSE CONTENT:

Unit – I

Introduction to compartmental model, exponential decay model, lake pollution model (case study of Lake Burley Griffin), drug assimilation into the blood (case of a single cold pill, case of a course of cold pills), exponential growth of population, limited growth of population, limited growth with harvesting. Epidemic model of influenza and its analysis. Phase plane analysis of epidemic model, analysis of battle model and predatory-prey model.

Unit – II

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's Form and singular solutions. Geometrical meaning of a differential equation. Orthogonal Trajectories. Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series method, Bessel and Legendre equations (only series solution).

BOOKS PRESCRIBED:

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longman (India), 1967.
2. G.F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. E.A. Codington: An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.

4. B.Barnes & G.R.Fulford: Mathematical modelling with case studies using (Maple & Matlab).
5. Belinda Barnes and Glenn R. Fulford, *Mathematical Modeling with Case Studies, A Differential Equation Approach using Maple and Matlab,* 2nd Ed., Taylor and Francis group, London and New York, 2009.
6. S.L. Ross, *Differential Equations,* 3rd Ed., John Wiley and Sons, India, 2004.
7. E. A. Coddington, An introduction to ordinary differential equation, Prentice- Hall of India.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
CO2	Find the complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and a particular solution. .
CO3	Have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.
CO4	Learn to formulate differential equations for various mathematical models.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV

COURSE CODE: BHMH – 402

COURSE TITLE: Statics and Vector Calculus

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 75
(THEORY: 56
INTERNAL ASSESSMENT: 19)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the resolution and composition of a number of forces.
- The content of this course gives the concept of parallel forces and couples, the concept of moments of forces and couples about a point and a line, friction and its applications.
- The course gives a detail information about the differentiation and integration of vector functions, properties of gradient, divergence and curl, the applications of Gauss divergence theorem, Stoke's theorem and Green's theorem.

COURSE CONTENT:

Unit-I

Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami's Theorem, λ-μ theorem). Resultant of a number of coplanar forces, parallel forces. Moments, Varignon‟s theorem of moments, Couples, Resultant of two Coplanar Couples, Equilibrium of two coplanar couples, Resultant of a force and a couple. Equilibrium of coplanar forces. Friction, Laws of friction, Equilibrium of a particle on a rough plane.

Unit-II

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, Vector integration, Theorems of Gauss, Green, Stokes and problems based on these.

BOOKS PRECRIBED:

1. S.L. Loney: Statics, Macmillan and Company, London.
2. R.S. Verma: A Text Book on Statics, Optical Pvt. Ltd., Allahabad.
3. Spiegal, M.R.: Introduction to Vector Calculus and Tensor.
4. Spiegal, M.R.: Vector Analysis.

Chairperson, BoS in Mathematics

Academic Session 2021-22

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the system of forces in equilibrium and differentiation and integration of vector functions.
CO2	Define the resolution and composition of a number of forces, parallel forces and couples, moments of forces and couples about a point and a line.
CO3	Generalise the theory behind the friction on horizontal and vertical planes.
CO4	Find directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
CO5	Understand the system of forces in equilibrium and differentiation and integration of vector functions.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV

COURSE CODE: BHMH 403

COURSE TITLE Physics-IV

CREDIT HOURS (PER WEEK):4

TOTAL HOURS:60 hrs

TIME: 3 hours **MAXIMUM MARKS: 50**

MEDIUM: English **(THEORY: 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

1. There will be five sections.
2. Section A carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.
3. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 7 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.
4. Scientific calculator is allowed.

COURSE OBJECTIVES:

- The objective of this course is to make students understand various types of crystal structures and symmetries and know the relationship between the real and reciprocal space and learn the Bragg's X-ray diffraction in crystals.
- Would also learn about phonons and lattice.
- This course also includes elastic waves, phonons, and lattice vibrational properties.
- A brief insight of semiconductors and based devices with applications is also included.
- The course forms a theoretical basis of experimental material science and technology

COURSE CONTENT:

UNIT-I

Classification of Solids, Space lattice and translation vectors, basis and Crystal structure, Unit cell, Symmetry operations, Two and Three dimensional Bravais lattices, Structure and Characteristics of Cubic Cells, Lattice planes and Miller indices, Density of atoms in a crystal plane, Diamond and NaCl structures.

UNIT–II

Crystal Diffraction: Bragg‟s law, Experimental methods for crystal structure studies, Laue equations, Reciprocal lattices of SC, BCC and FCC, Brag's law in reciprocal lattice, Brillouin zones and its construction in two and three dimensions, Structure factor and atomic form factor.

UNIT–III

Lattice vibrations, Monoatomic linear chains, Density of modes, Concept of phonons, Scattering

of photons by phonons, Specific heat in solids, Einstein and Debye models of specific heat.

UNIT–IV

Free electron model of metals (Drude Lorentz Classical theory), Sommerfeld quantum theory, Fermi energy, Total and Average energy, Density of states, Three dimensional potential well, Fermi Dirac distribution function, Qualitative discussion of the following: Conductivity and its variation with temperature in semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, band gap in semiconductors, pn junction diode and light emitting diode, zener diode as voltage stablizer.

BOOKS PRESCRIBED:

1. Condensed Matter Physics by T.S. Bhatia (Vishal Publishing Co.)
2. Condensed Matter Physics by T.S. Bhatia and V.K. Sharma (S.Vikas and Co.))
3. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
4. Elements of Modern Physics by S.H. Patil (TMGH, 1985).
5. Solid State Physics by R.K. Puri and V. K. Babbar (S.Chand)

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Differentiate between different lattice types and Miller indices. They can explain NaCl and diamond structure.
CO2	Explain the concepts of reciprocal lattice, Brillouin zones and crystal diffraction.
CO3	Explain the concept of lattice vibrations and effect of the same on electrical and thermal properties of the solids.
CO4	Explain Einstein's and Debye's model of specific heat.
CO5	Explain band structures and their variation with temperature leading to change in material properties. Semiconductor diodes are also be explained.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV

COURSE CODE: BHMH-404

COURSE TITLE: Molecular Spectroscopy-IV

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3 Hours **MAXIMUM MARKS:50**

MEDIUM: English **(THEORY: 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section I.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

COURSE OBJECTIVES:

- Students will acquire the knowledge of energy and electromagnetic spectrum, ultraviolet and visible spectroscopy, Infrared spectroscopy.
- They will know about the applications of Wood-Fischer rule and IR Spectroscopy selection rules, factor affecting wave number.
- This course will help the students to know the instrumentation and basic concepts of NMR and Mass spectroscopy.
- They will be able to solve problems related to UV, IR, NMR and mass spectroscopy.

COURSE CONTENT:

UNIT – I

1. Energy and Electromagnetic Spectrum **5 Hrs**

Introduction, electromagnetic spectrum and Units, Regions of the spectrum, Basic features of different spectrometers, Statement of Born-Oppenheimer approximation, Degree of freedom, Frank Condon Principle, Fluorescence and Phosphorescence.

II. Ultraviolet and Visible Spectroscopy **6 Hrs**

The energy of electronic excitation, Measurement techniques, Beer-Lambert Law, Molar

extinction coefficient. Different types of transition noticed in UV spectrum of organic functional groups and their relative energies. Chromophore, Auxochromes, Absorption and intensity shifts, Transition probability. Factors affecting λ_{max} , Effect of steric hindrance to coplanarity, Solvent effects.

UNIT – II

III. Infrared Spectroscopy 5 Hrs

Vibrational energy levels, Selection rules, Force constant, Fundamental vibration frequencies, Factors influencing Vibrational Frequencies (Vibrational Coupling, Hydrogen Bonding, Electronic effect, Bond Angles, Field Effect) of different functional groups. Sampling techniques.

IV. Applications of UV and IR Spectroscopy 7 Hrs

Applications of UV spectroscopy, Woodward Fieser rules for calculating λ_{max} of conjugated polyenes and α,ß -unsaturated carbonyl compounds. Applications of IR spectroscopy, Absorption of Common functional Groups, Interpretation of simple IR spectra, Finger print regions. Simple numerical problems based on UV and IR spectroscopy.

UNIT-III

V. Proton Magnetic Resonance spectroscopy (^{1}H NMR) 6 Hrs

The Nuclear spin, Larmor frequency, the NMR isotopes, Population of nuclear spin level, Spin and Spin lattice relaxation. Measurement techniques (CW & FT method), Solvent used. Chemical shift, Reference compounds, Shielding constant, Range of typical chemical Shifts, Simple application of chemical shifts, Anisotropic effect. Spin spin splitting, Coupling constant.

VI. Applications of NMR spectroscopy 5 Hrs

NMR spectra with various examples such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene, o-, m-, p- anisidine, o-, m-, p- nitrophenols, acetophenone. Simple numerical of structure elucidation of NMR spectroscopic data.

UNIT- IV

VII. Mass Spectrometery 5 Hrs

Basic Principles. Elementary theory. Molecular ions, isotope ions, Fragment ions of odd and even electron types, Nitrogen rule, Factors affecting cleavage patterns, Simple cleavage,

Cleavages at a hetero atom, Multicentre fragmentations, Rearrangements, Diels – Alder fragmentation, Mc Lafferty rearrangement.

VIII. Applications of Mass Spectroscopy 6 Hrs

Cleavage associated with common functional groups , Aldehydes, Ketones, Cyclic and Acyclic Esters, Alcohols, Olefins, Aromatic compounds, Amines, Interpretation of the spectrum of unknown simple molecules.

BOOKS PRESCRIBED:

1. Organic Spectroscopy By W. Kemp; Publisher- Palgrave, New York
2. D.H. Williams and I. Fleming. Spectroscopic Methods in Organic Chemistry.
3. Spectrometric Identification of Organic Compounds - R.M. Silverstein & F. X. Webster; Publisher: John Willey and Sons,Inc.
4. Introductory Problems in Spectroscopy- By R.C. Banks, E.R. Matjeha and G. Mercer; Publisher : The Benzamine / Cummings Publishing Company Inc.
5. Introduction to Spectroscopy – D. L. Pavia, G. M .Lampman, and G. S. Kriz Publisher: Brooks / Cole, a part of cengage learning

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the spectrums, their types and characteristics.
CO2	Understand the various aspects of UV-Visible spectroscopy and behaviour of UV-peaks and its shifting under different conditions.
CO3	Solve the absorption wavelength of conjugated polyenes and α,ß -unsaturated carbonyl compounds
CO4	Interpret the IR spectrum and relate the spectral peaks with the various types of bonds present in the molecules.
CO5	Interpret the actual NMR spectrum and calculate the chemical shift, coupling constant and correlate the NMR peaks with structure and proton counting.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Biotech., Food Sci., Comp. Sci., Eco., FD., IT., Med., Non Med.)/ B.Sc. (Hons.-Physics, Chemistry, Maths)/B.B.A./B.C.A./B.Com./B.Com. (Hons.)/ BJMC/BA Social Sciences/BA (Hons.) Punjabi, BA (Hons.) English

Sem-IV

COURSE CODE: BHMH-405/ESL222

COURSE TITLE: ENVIRONMENTAL STUDIES–II (COMPULSORY)

CREDIT HOURS (PER WEEK): 2

TOTAL HOURS: 30 hrs

TIME:3Hours **MAXIMUM MARKS: 50**

MEDIUM: English/Hindi/Punjabi

INSTRUCTIONS FOR PAPER SETTERS: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each unit of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.

Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.

Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.

COURSE OBJECTIVES:

- To study the concept of Biodiversity – role, importance, values and its conservation. Hot spots and threats to biodiversity.
- To create awareness regarding environmental pollution, its causes and effects and preventive measure to control the different types of pollution.
- To make students aware of growing human population – causes and concern. Family welfare programs. Road safety (Traffic) rules.
- To know about entrepreneurship development and civil/self defense.

COURSE CONTENT:

Unit-I

Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option values.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic species of India.

- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.

Unit-II

Environmental Pollution:

- Definition, causes, effects and control measures of:
  a) Air Pollution
  b) Water Pollution
  c) Soil Pollution
  d) Marine Pollution
  e) Noise Pollution
  f) Thermal Pollution
  g) Nuclear Hazards
  h) Electronic Waste

- Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster Management: Floods, Earthquake, Cyclone and Landslides.

Unit-III

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion-Family welfare programme.
- Environment and human health.
- Human rights.
- Value education.
- HIV/AIDS.
- Women and child welfare.
- Role of information technology in environment and human health.
- Case studies.
- Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'ts while Driving, Role of Citizens or Public Participation, Responsibilities of Public under Motor Vehicle Act, 1988, General Traffic Signs.
- Accident & First Aid**:** First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance.

Unit-IV

National Service Scheme:

- **Entrepreneurship Development:** Definition & Meaning; Qualities of good entrepreneur; Steps/ ways in opening an enterprise; Role of financial and support service Institutions.
- **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self-defense training.

Field Visits:

- Visit to a local area to document environmental assets–river/forest/grassland/hill/ mountain.
- Visit to a local polluted site–Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems–pond, river, hill slopes etc.
- Contribution of the student to NSS/any other social cause for service of society.

Note: In this section the students will be required to visit and write on the environment of an area/ ecosystem/vi1lage industry/disaster/mine/dam/agriculture field/waste management/hospital etc. with

its salient features, limitations, their implications and suggestion for improvement.

BOOKS PRESCRIBED:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Know about the meaning of Biodiversity and its role in environment.
CO2	Learn about the causes of different forms of pollution and their control measures.
CO3	Understand the causes and challenges of growing human population, women and child welfare programs.
CO4	Know the development of entrepreneurship and techniques of civil/self-defense.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics, Physics, Chemsitry) Sem-IV

COURSE CODE: BHMH-406 INTERDISCIPLINARY COURSE ID-II

COURSE TITLE: Geography

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 30
INTERNAL ASSESSMENT: 13
PRACTICAL: 07)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

Section A: - It will consist of 10 questions from the entire syllabus. All questions are compulsory. Each question will carry one mark; the total weightage being 10 marks.

(10 x 1=10 Marks)

Section B: - It will consist of 8 short answer questions upto 100 words in length. The students will be required to attempt any 5 questions. Each question will carry 4 marks the total weightage being 20 marks. **(5 x 4=20 Marks)**

COURSE OBJECTIVES:

- To develop in them an understanding of basic concepts, principals and theories relating to geographical phenomena.
- Students will gain factual knowledge about atmospheric phenomena, global climate system and global oceans.

COURSE CONTENT:

Part A: Physical Geography

1. **Exploring the Earth:** The shape of the Earth, The Earth‟s movements, Day and Night, The Earth‟s Revolution, Dawn and Twilight, Latitude and Longitude, Longitude and Time, Standard Time and Time Zones, The International Date line.
2. **The Earth's Crust:** The Structure of the Earth, Classification of Rocks, (Igneous, Sedimentary and Metamorphic), Types of Mountains, Types of Plateau, Types of Plains.
3. **The Oceans:** The movements of Ocean currents, The Indian Ocean circulation.

Part B: Weather, Climate and Vegetation

1. **Weather:** The Difference between Climate and Weather, The Elements of Weather and Climate: Rainfall, Pressure, Temperature and Humidity, Winds, Sunshine.

2. **Climate:** The Atmosphere, Insulation, Elements of Climate and Factors affecting temperature, Precipitation, Rainfall, Monsoon.
3. **Vegetation:** Climatic types and natural vegetation, World Climatic types.

Part-C: Practical Work

Maps: Physical (India and World), Types of soil (India), Monsoon
Maps: Vegetation (India), rainfall (India and World), natural Calamities (Last 6 months) Viz. earthquake, flood, cyclone, tsunami, landslides.

BOOKS PRESCRIBED:

a) Certificate Physical & Human Geography by G.C. Leong
b) Oxford India Atlas (Latest Edition)
c) Spectrum- Geography & India

COURSE OUTCOMES:

- It enables the students to aquire basic knowledge of geography as a spatial science and to secure employment in the sectors of geospatial analysis development and planning mapping.
- Understand effects of rotation, revolution and interior structure of the earth.
- Analyze the interaction between Earth's atmosphere and Earth's surface and how atmospheric moisture works.
- Learn the behavior and characteristics of global oceans.

Sr. No.	On completing the course, the students will be able to:
CO1	Aquire basic knowledge of geography as a spatial science and to secure employment in the sectors of geospatial analysis development and planning mapping.
CO2	Understand effects of rotation, revolution and interior structure of the earth.
CO3	Analyze the interaction between Earth's atmosphere and Earth's surface and how atmospheric moisture works.
CO4	Learn the behavior and characteristics of global oceans.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV
COURSE CODE: BHMH-407
COURSE TITLE: PHYSICS LAB-IV

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs

Time: 3 hours **MAXIMUM MARKS: 50**
(THEORY: 37

MEDIUM: English **INTERNAL ASSESSSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTER:

I. The distribution of marks is as follows: **Max. Marks: 37+13(Internal Assessment)**
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

COURSE OBJECTIVES:

- The purpose of the course is to understand the concept of energy band gap in semiconductors, working of Zener diode, LED, Germanium and silicon diodes, to understand the variation of resistance of a thermistor with temperature.
- It includesthe measurement of magnetic parameters from BH curves, working of CRO, dielectric constant of various liquids by working on dipole meter.

COURSE CONTENTS:

1. Determination of Resistivity and Band Gap of Semiconductors by Four Probe Method at different temperatures.
2. Finding the energy band gap of semiconductor material of a P-N junction of diode.
3. Study of Characteristics of Silicon and Germanium diode.
4. Study of characteristics of Zener diode.
5. Study of characteristics of light emitting diode.

6. To study the stabilization of output voltage of a power supply with Zener diode with variable input voltage and with variable load resistance.
7. To show the variation of resistance of a thermistor with temperature.
8. To trace the B-H curves for different materials using CRO and find the magnetic parameters from these.
9. To determine Hall coefficient by Hall Effect.
10. To determine Stefan‟s constant using Boltzmann‟s Law.
11. To study the dielectric constant of various liquids using dipole meter.

BOOKS PRESCRIBED:

1. Practical Physics Volume-III, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2. Practical Physics, C.L. Arora, S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the concept of energy band gap in semiconductors.
CO2	Gain the knowledge about working of Zener diode, LED, Germanium and silicon diodes.
CO3	Understand the variation of resistance of a thermistor with temperature.
CO4	Find magnetic parameters from BH curves by working on CRO.
CO5	Find out the dielectric constant of various liquids by working on dipole meter.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV

COURSE CODE: BHMH 408

COURSE TITLE: Physical Chemistry Lab-IV

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 37
INTERNAL ASSESSMENT: 13)

TIME: 3 Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTER:

I. Examiner will set two questions involving two different techniques.
II. Students will be asked to complete write up of both practical within first 20 minutes on the first sheet provided.
III. On the second sheet provided after 20 minutes, students will perform and note the record on second sheet during the conduct of practical exam
IV. The split of marks will be as under:
(Write up = 12, Performance = 12, Viva-voce = 8, Practical note book = 5)

COURSE OBJECTIVES: Students will be able to find strength, normality of unknown solution through conductometric titration, adsorption isotherms, polarimetry, refractometric, use of calorimeter to find enthalpy of neutralization of strong acid and base.

COURSE CONTENT:
Note. The question paper will be set by the examiner based on the syllabus.

1. Refractometry: Determine refractive index of a given liquid as a criterion for its purity. (Benzene i.e. commercial) benzene + A.R. acetone).

2. Polarimetry: Determine the %age composition of an optically active solution.

3. Calorimetry:
   a) Determination of Heat of neutralization
      (i) Strong acid-strong base
      (ii) Weak acid-strong base.
   b) Determination of Heat of solution of KCl, NH_4Cl, KNO_3

4. Conductometry:
   a) Determination of cell constant.
   b) Determination of specific and equivalent conductance of electrolyte (NaCl andHCl).

c) Precipitation titration of Na_2SO_4 vs. $BaCl_2$.
d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH.

5. Determination of adsorption isotherm of oxalic acid on charcoal.

BOOKS PRESCRIBED:

1. Advance Practical Chemistry, J. B. Yadav

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Learn to measure refractive index of various solvents using refractometer. . .
CO2	Learn to measure angle of rotation with the help of polarimeter and then calculate the optical activity of various solutions. .
CO3	Learn to calculate the heat of neutralization, heat of solution of acids, bases and salts with the help of a calorimeter.
CO4	Perform experiments on conductometer which enable students to learn how to measure the cell constant, equivalent conductance, specific conductations and perform conductometric titrations.
CO5	Learn about the adsorption isotherm by performing the experiment of adsorption

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V

COURSE CODE: BHMH 501

COURSE TITLE: Probability and Statistics

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS:60 hrs

TIME: 3 hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1.The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.

2.Section–A will consist of six compulsory questions, each of one mark.

3.Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.

4. Teaching time for this paper would be six periods per week.

5. Use of non-programmable scientific calculator is allowed.

COURSE OBJECTIVES:

- The objective of the course is to prepare students for big data analysis by introducing basic concepts of statistics and probability theory along with their applications.
- The course content is designed to introduce mathematical definition of probability, conditional probability and its applications.
- The course explains the theoretical concepts like random variable, probability distribution, generating functions and their usage.

COURSE CONTENT:

Unit-I

Sample space, probability axioms, real random variables (discrete and continuous), probability mass/density functions, mathematical expectation, moments, moment generating function,

characteristic function, Binomial distribution, Poisson distribution.

Unit-II

Normal distribution, Joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables.

BOOKS PRESCRIBED:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia, 2006.
3. Sheldon Ross, Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint, 2007.
4. Alexander M. Mood, Franklin A. Graybill and Duane C. Boes, Introduction to the Theory of Statistics, 3rd Ed., Tata McGraw- Hill, Reprint 2007 .

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Have deep understanding of foundation of probabilistic and statistical analysis.
CO2	Aquaint with different types of discrete and continuous distributions and their utilization.
CO3	Have good understanding of exploratory data analysis.
CO4	Learn about distributions to study the joint behavior of two random variables.
CO5	Apply the knowledge of statistical techniques in various experimental and industrial requirements.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V
COURSE CODE: BHMH 502
COURSE TITLE: Group Theory

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
TIME: 3Hours **MAXIMUM MARKS: 75**
MEDIUM: English **(THEORY: 56**
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Group theory is the detail study of groups in abstract algebra.
- Using group theory, Modern physics is based on symmetry principles and by the application of group theory the existence of several particles was predicted before they were experimentally observed.
- In chemistry, the symmetry of a molecule provides us with the information of what energy levels the orbital will be, what the orbital symmetries are, what transitions can occur between energy levels, even bond order and all of that is calculated using group theory.

COURSE CONTENT:

Unit-I

Group: Definition and examples of groups including permutation groups and quaternion groups, elementary properties of groups, Subgroups and examples of subgroups, centralizer, normalizer, center of a group, Normal subgroup, Quotient Group, Properties of cosets, Lagrange's theorem.

Unit-II

Generating set, cyclic groups, commutator subgroups, conjugate elements and class equation of finite groups, Group homomorphisms, properties of homomorphisms, Cayley's theorem, properties of isomorphisms, Automorphism, Inner Automorphism.

BOOKS PRESCRIBED:

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A. Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa Publishing House, New Delhi, 1999.
4. Joseph J. Rotman, An Introduction to the Theory of Groups, 4th Ed., Springer Verlag, 1995.
5. I.N. Herstein, Topics in Algebra, Wiley Eastern Limited, India, 1975.

COURSE OUTCOMES:

CO1	Recognize the mathematical objects that are groups and classify them as abelian, cyclic and permutation groups.
CO2	Link the fundamental concepts of groups and symmetrical figures.
CO3	Know about group homomorphisms and isomorphisms.
CO4	Learn the applications of Lagrange's Theorem.
CO5	Know the significance of co sets and normal subgroups.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V

COURSE CODE: BHMH 503

COURSE TITLE: Number Theory

CREDIT HOURS (PER WEEK):4

TOTAL HOURS:60 hrs

MAXIMUM MARKS: 75

TIME: 3 hours **(THEORY: 56**

MEDIUM: English **INTERNAL ASSESSMENT: 19**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES

- To provide an introductory course in number theory.
- To introduce the fast growing and relevant topic of cryptography as an application of number theory.

COURSE CONTENT:

Unit-I

The division algorithm, The greatest common divisor, least common multiple, The Diophantine equation ax + by = c Prime numbers and their distribution, The fundamental theorem of arithmetic, Basic properties of congruences, Linear congruences, Special divisibility tests.

Unit-II

Chinese remainder theorem, The Fermat's theorem, Wilson's theorem, τ and σ functions, Mobius Inversion formula, Greatest integer function, Euler‟s Phi function, Euler's theorem,

some properties of the Phi Function.An Application to cryptography:Encryption and Decryption using linear congruence.

BOOKS PRESCRIBED:

1. D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope inChapters 2-5, 7-12)., 2005
2. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Know about some fascinating discoveries related to properties of prime numbers.
CO2	Understand the study of integers and integer-valued functions.
CO3	Apply number theory in many applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
CO4	Understand various types of numbers and their properties, various arithmetic functions.
CO5	Understand the concept of G.C.D. and L.C.M. of numbers and the relation between linear Diophantine equations and congruences which help to solve various arithmetic problems.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V

COURSE CODE: BHMH 504

COURSE TITLE: Partial Differential Equations

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS: 60 hrs

TIME: 3Hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Partial differential equation (PDE) models will help to prepare physiological modeling of the evolution of a biological substance.
- The objective of this course is to introduce students with Partial Differential Equations and different methods to solve linear PDEs of both first and second order, classification and canonical transformation of second order linear PDEs.
- PDEs & ODEs techniques will help to predict the behaviour of certain real phenomena by identifying them as models of partial derivatives equations and extract information to interpret reality.

COURSE CONTENT:

Unit-I

Basic concepts and Definitions, Mathematical Problems. FirstOrder Equations: Classification, Construction and Geometrical Interpretation. Method of Characteristics for obtaining General

Solution of Quasi Linear Equations. Canonical Forms of First-order Linear Equations. Method of Separation of Variables for solving first order partial differential equations.

Unit-II

Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients, Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients.

BOOKS PRESCRIBED :

1. Tyn Myint-U and Lokenath Debnath, Linear Partial Differential Equations for Scientists and Engineers, 4th edition, Springer, Indian reprint, 2006.
2. S.L. Ross, Differential equations, 3rd Ed., John Wiley and Sons, India, 2004.
3. Martha L Abell, James P Braselton, Differential equations with MATHEMATICA, 3rd Ed., Elsevier,Academic Press.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the theory of partial differential equations which stems from the intensive and extensive study of a few basic equations of mathematical physics.
CO2	Apply partial differential equation (PDE) models for the physiological modeling of the evolution of a biological substance.
CO3	Understand different methods to solve linear PDEs.
CO4	Predict the behavior of certain real phenomena by identifying them as models of partial derivatives equations.
CO5	Apply the method of separation of variables for solving many well- known second order PDEs.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V

COURSE CODE: BHMH-505

COURSE TITLE: Introduction to Python

CREDIT HOURS (PER WEEK): T4+P2.6

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 75

(THEORY: 37

THEORY INTERNAL ASSESSMENT MARKS: 13

TIME: 3 Hours **PRACTICAL MARKS: 20**

MEDIUM: English **PRACTICAL INTERNAL ASSESSMENT MARKS: 05)**

INSTRUCTIONS FOE PAPER SETTER:

Note: 1. Medium of Examination is English Language.

2. The question paper covering the entire course shall be divided into three sections.

Section A: (Total weightage 9 Marks). This section will have 9 very short answer type questions. All questions will be compulsory. Each question will carry 1 mark. Questions are to cover the whole of syllabi.

Section B: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 2, 3, 4 and 5 will be set by the examiner from Unit-I of the syllabus. The students will be required to attempt any two questions. Each question will carry 7 marks.

The total weightage of this section shall be **14 marks.**

Section C: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 6, 7, 8 and 9 will be set by the examiner from Unit-II of the syllabus. The students will be required to attempt any two questions. Each question will carry 7 marks.

Academic Session 2021-22

The total weightage of this section shall be **14 marks**.

COURSE OBJECTIVES:

- Describe the core syntax and semantics of Python programming language.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Infer the Object-oriented Programming concepts in Python.
- To develop the ability to write database applications in Python.

COURSE CONTENT:

UNIT-I

Introduction to Python: Process of Computational Problem Solving, Python Programming Language
Data and Expressions: Literals, Variables and Identifiers, Operators, Expressions, Statements and Data Types
Control Structures: Boolean Expressions (Conditions), Logical Operators, Selection Control, Nested conditions, Debugging
Lists: List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python
Functions: Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments
Iteration: While statement, Definite loops using For, Loop Patterns, Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion

UNIT-II

Dictionaries: Dictionaries and Files, Looping and dictionaries, Advanced text parsing
Files: Opening Files, Using Text Files, String Processing, Exception Handling
Objects and Their Use: Introduction to Object Oriented Programming
Modular Design: Modules, Top-Down Design, Python Modules
Using Databases and SQL: Database Concepts, SQLite Manager Firefox Add-on, SQL basic summary, Basic Data modeling, Programming with multiple tables

BOOKS PRESCRIBED:

1. Python for Informatics, Charles Severance, version 0.0.7
2. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Charles Dierbach, Wiley Publications, 2012, ISBN : 978-0-470-91204-1
3. Introduction To Computation And Programming Using Python, GUTTAG JOHN V, PHI, 2014, ISBN-13: 978-8120348660
4. Introduction to Computating& Problem Solving Through Python, Jeeva Jose and Sojan P. Lal,Khanna Publishers, 2015, ISBN-13: 978-9382609810
5. Introduction to Computing and Programming in Python, Mark J. Guzdial, Pearson Education, 2015, ISBN-13: 978-9332556591
6. Fundamentals of Python by Kenneth Lambert, Course Technology, Cengage Learning , 2015
7. Learning Python by Mark Lutz, 5th Edition, O'Reilly Media, 2013

COURSE OUTCOMES:

Academic Session 2021-22

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge of one of the latest and powerful programming languages – Python.
CO2	Understand about to read and write files.
CO3	Get a broader view of concept of Object Oriented Programming (OOP) applied in Python. .
CO4	Learn how to connect Python programs to a database.
CO5	Learn how to identify Python object types.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V

COURSE CODE: BHMH 506

COURSE TITLE: Seminar and Assignment

CREDIT HOURS (PER WEEK): 2

TOTAL TIME: 30 hrs

MAXIMUM MARKS: 25

TIME: 3 hours **(PRESENTATION: 20**

MEDIUM: English **INTERNAL ASSESSMENT: 05)**

INSTRUCTIONS FOR PAPER SETTERS: In this paper, the students will be allotted a topic and they have to prepare a presentation under the supervision of assigned teacher. An external examiner will be appointed to evaluate

the performance of the students during final examination

COURSE OBJECTIVES:

- To learn to present one's views and knowledge about various mathematical concepts.
- To get familiar with preparqation of power pointpresentation.
- To work on various mathematical topics beyond the syllabus.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Develop presentation skills.
CO2	Enhance discussion abilities, flexibility of thought and effective time management.
CO3	Apply theories, methods, and concepts from multiple fields to single concept.
CO4	Improve their listening skills and develop persuasive speech, present information in a well-structured and logical sequence.
CO5	Get experience to face a panel in logical way.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI

COURSE CODE: BHMH 601

COURSE TITLE: Linear Programming

CREDIT HOURS (PER WEEK): 4

TOTAL TIME: 60hrs

TIME: 3 hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The course will introduce the graphical solutions of linear programming problems with two variables, and illustrate the concept of convex set and extreme points.
- The course is designed to introduce the relationships between the primal and dual problems, and to understand sensitivity analysis.
- The course gives introduction of simplex method.
- The course explains the detailed procedure of transportation, assignment and two-person zero-sum game problems.

COURSE CONTENT:

Unit-I

Introduction to linear programming problem, Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison.

Duality, formulation of the dual problem, primal-dual relationships, Dual Simplex method.

Unit-II

Transportation problem and its mathematical formulation, northwest-corner method least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.

Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure, linear programming solution of games.

BOOKS PRESCRIBED:

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows,* 2nd Ed., John Wiley and Sons, India, 2004.
2. F.S. Hillier and G.J. Lieberman, *Introduction to Operations Research,* 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha, *Operations Research, An Introduction,* 8th Ed., Prentice-Hall India, 2006.
4. G. Hadley, *Linear Programming*, Narosa Publishing House, New Delhi, 2002.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Apply the knowledge of basic optimization techniques in order to get best possible results from a set of several possible solutions of different problems.
CO2	Understand basic assumptions and properties of linear programming.
CO3	Understand special situations such as redundancy, infeasibility, unboundedness and alternate optimal solutions in linear programming problems.
CO4	Understand theoretical foundation and implementation of similar type optimization techniques available in the scientific literature
CO5	Extend their knowledge of basic optimization techniques to do interesting research work on these types of optimization techniques

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI
COURSE CODE: BHMH 602
COURSE TITLE: Numerical Analysis

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS: 60 hrs
TIME: 3 hours **MAXIMUM MARKS: 75**
MEDIUM: English **(THEORY: 56**
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.
5. Use of scientific non-programmable calculator is allowed.

COURSE OBJECTIVES:

- Numerical analysis naturally finds application in all the fields of engineering and the physical sciences, but in the 21st century also the life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.
- The content of this course is designed to make the students understand the use of Numerical analysis in detecting errors in numerical calculations,
- It enable the students to solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.

Academic Session 2021-22

COURSE CONTENT:

Unit-I

Algorithms, Convergence, Errors: Relative, Absolute, Round off, Truncation.
System of Non-linear algebraic equations: Bisection method, Newton's method, Secant method. Order of convergence of these methods.
System of linear algebraic equations: Gaussian Elimination and Gauss Jordan methods. Jacobi method, Gauss Seidel method and their convergence analysis.

Unit-II

Interpolation: Lagrange and Newton's methods. Error bounds. Finite difference operators. Gregory forward and backward difference interpolation.
Numerical Integration: Trapezoidal rule, Simpson's rule, Simpsons 3/8th rule, Boole's Rule. Midpoint rule, Composite Trapezoidal rule, Composite Simpson's rule.
Ordinary Differential Equations: Euler's method. Runge-Kutta methods of orders two and four.

BOOKS PRESCRIBED:

1. Brian Bradie, *A Friendly Introduction to Numerical Analysis*, Pearson Education, India, 2007.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering Computation*, 6th Ed., New age International Publisher, India, 2007.
3. C.F. Gerald and P.O. Wheatley, *Applied Numerical Analysis*, Pearson Education, India, 2008.
4. Uri M. Ascher and Chen Greif, *A First Course in Numerical Methods*, 7th Ed., PHI Learning Private Limited, 2013.
5. John H. Mathews and Kurtis D. Fink, *Numerical Methods using Matlab*, 4th Ed., PHI Learning Private Limited, 2012.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the use of numerical analysis in detecting errors in numerical calculations.
CO2	Solve linear and non-linear equations, numerical differentiation and integration and differential equations.
CO3	Have the knowledge of the study of algorithms that use numerical approximation for the problems of mathematical analysis.
CO4	Apply numerical analysis in all the fields of engineering, physical sciences, life sciences, social sciences, medicine, business.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI

COURSE CODE: BHMH 603

COURSE TITLE: Discrete Mathematics and Graph Theory

CREDIT HOURS (PER WEEK):4
TOTAL HOURS: 60 hrs
MAXIMUM MARKS: 75
(THEORY: 56
INTERNAL ASSESSMENT: 19)

TIME: 3 Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- To learn sets and its operations and represent using Venn diagram.
- To represent the problem using propositional logic and convert it as gates and truth table.
- To visualize the given problem as graphs and tree representation

COURSE CONTENT:

Academic Session 2021-22

Unit-I

Set Theory: Sets, Types of sets, subsets, Power Set, Set operations, laws of set theory and Venn diagrams. Inclusion-Exclusion Principle. Principle of Duality, multiset, partition of a set, Minsets and Maxsets.

Relation and Functions: Cartesian Product of sets. Relation, Domain and Range, Inverse relation, Graphical and Diagrammatical representation of relations, Types of relations, Equivalence Relations, Partial ordering relations, n-ary relations, Composition of relations. Definition, Domain and Range, Bijective functions, Inverse of function.

Mathematical Logic: Introduction, Truth table, negation, conjunction and disjunction of propositions. Implications, biconditional propositions, converse, contra positive and inverse propositions, tautology and contradiction, Propositional equivalence, Logical equivalences.

Unit-II

Boolean Algebra: Introduction, laws and logic gates. Fundamental products, Boolean expressions, POS and SOP of Boolean functions.

Graph Theory: Definition, examples and basic properties of graphs, complete graphs, bi-partite graphs, weighted graph, the adjacency matrix, Incidence matrix, paths and circuits, Regular graph, First theorem of Graph Theory and its applications. Complement of a graph, Union & intersection of two graphs, Addition of two graphs.

BOOKS PRESCRIBED:

1. R.P. Grimaldi, *Discrete Mathematics and Combinatorial Mathematics*, Pearson Education, 1998.
2. Edgar G. Goodaire and Michael M. Parmenter, *Discrete Mathematics with Graph Theory*, 2nd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint 2003.
3. Seymour Lipschutz, Discrete mathematics, Schaum's Outlines, Mc Graw Hill Education.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Interpret the results of lattices in various engineering problems.
CO2	Acquaint themselves for a wide range of applications in analyzing, designing and simplifying electronic devices including digital computer, dial telephone, switching system and different kind of control devices.
CO3	Understand the graph theory consisting of vertices and edges.
CO4	Learn to apply the graphs in finding the travelling routes.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI

COURSE CODE: BHMH 604

COURSE TITLE: Dynamics

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

TIME: 3 Hours **MAXIMUM MARKS: 75**

MEDIUM: English **(THEORY: 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

Chairperson, BoS in Mathematics

Academic Session 2021-22

COURSE OBJECTIVES:

- To understand the motion of particles in a straight line with constant acceleration.
- To get familiar with Newton's laws of motion.
- To understand the curvilinear motion, simple harmonic motion and the concept of work, power and energy.

COURSE CONTENT:

Unit-I

Rectilinear motion in a starlight line with uniform acceleration, Newton's laws of motion.Motion of two particles connected by a string. Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit-II

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum. Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

BOOKS PRESCRIBED:

1. S.R.Gupta: A text book of Dynamics
2. F. Chorlton: Dynamics.
3. S.L. Loney: An Elementary Treatise on the Dynamics of a Practice and of Rigid Bodies, Cambridge University Press, 1956.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Handle the problems based on rectilinear motion.
CO2	Understand the applications in science and engineering like in physics, inertial reference frame, and free body diagram.
CO3	Deal with the problems based on variable acceleration.
CO4	Use concepts of work, power and energy to solve practical problems.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI

COURSE CODE: BHMH 605

COURSE TITLE: Linear Algebra

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 75
(THEORY: 56
INTERNAL ASSESSMENT: 19)

TIME: 3 Hours
MEDIUM: English

Chairperson, BoS in Mathematics

Academic Session 2021-22

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. Section–A will consist of six compulsory questions, each of one mark.
3. Sections–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from sections-B & C. Each question carries 10 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- To understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
- To get familiar with Quotient space, Direct sum, linear span and linear independence.
- To understand the concept of Rank and nullity of linear transformations.
- To relate matrices and linear transformations.

COURSE CONTENT:

Unit-I

Definition of Ring and Field with examples, Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

Unit-II

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphisms, Isomorphism theorems, invertibility and isomorphisms, change of basis, linear operator.

BOOKS PRESCRIBED:

1. John B. Fraleigh, *A First Course in Abstract Algebra,* 7th Ed., Pearson, 2002**.**
2. M. Artin, *Abstract Algebra,* 2nd Ed., Pearson, 2011.
3. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra,* 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
4. Joseph A. Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa Publishing House, New Delhi, 1999.
5. S. Lang, *Introduction to Linear Algebra,* 2nd Ed., Springer, 2005.
6. Gilbert Strang, *Linear Algebra and its Applications*, Thomson, 2007.
7. S. Kumaresan, *Linear Algebra- A Geometric Approach*, Prentice Hall of India,1999.
8. Kenneth Hoffman, Ray Alden Kunze, *Linear Algebra,* 2nd Ed., Prentice-Hall of India Pvt.Ltd., 1971.
9. D.A.R. Wallace, *Groups, Rings and Fields*, Springer Verlag London Ltd., 1998

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:

Academic Session 2021-22

CO1	Handle the problems based on vector spaces, subspaces, basis and dimensions.
CO2	Check the linear independence of vectors.
CO3	Form the linear combination of vectors.
CO4	Find the matrix corresponding to a linear transformation and vice versa.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI

COURSE CODE: BHMH 606

COURSE TITLE: Seminar and Assignment

CREDIT HOURS (PER WEEK):2
TOTAL HOURS: 30 hrs

TIME: 3 Hours **MAXIMUM MARKS: 25**
MEDIUM: English **(PRESENTATION: 20**
INTERNAL ASSESSMENT: 05)

INSTRUCTIONS FOR PAPER SETTERS: In this paper, the students will be allotted a topic and they have to prepare a presentation under the supervision of assigned teacher. An external examiner will be appointed to evaluate the performance of the students during final examination.

COURSE OBJECTIVES:

- To learn to present one's views and knowledge about various mathematical concepts.
- To get familiar with preparqation of power pointpresentation.
- To work on various mathematical topics beyond the syllabus.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Develop presentation skills.
CO2	Develop discussion abilities, flexibility of thought and effective time management
CO3	Apply theories, methods, and concepts from multiple fields to single concept.
CO4	Improve listening skills and develop persuasive speech skills, present information in a well-structured and logical sequence.
CO5	Get experience to face a panel in logical way.

Academic Session 2021-22

PROGRAMME: M.Sc. (Mathematics)
PROGRAMME CODE:MMAT

The M.Sc. Mathematics Degree programme lays equal emphasis on motivating and training students towards higher education in the discipline and employability. With the focus on imparting quality education, the students are exposed to pure, applied and applicable Mathematics. Intercollegiate competitions are organised and interclass competitions in Mathematics taps the potentials of the students. Participation are offered to students to widen the horizon of knowledge with a focus on research.

ELIGIBILITY:

The Candidate who has passed

a) B.A./B.Sc. with 50% marks in aggregate and having Mathematics as one of the subjects.

b) B.A./B.Sc. with Mathematics as elective subject with 50% marks in aggregate.

c) B.Sc. (Hons.) in Mathematics with 50% marks in aggregate.

d) B.A. /B.Sc. in full subjects obtaining 45% marks in Mathematics

PROGRAMME OBJECTIVES:

- To enhance problem solving skills and develop logical thinking.
- To exhibit proficiency in application of mathematics to solve daily life problems

PROGRAMME SPECIFIC OUTCOMES:

- Understand the nature of abstract mathematics and explore the concepts in various fields.
- Inculcate mathematical reasoning and assimilate complex mathematical ideas and arguments.
- Communicate mathematical ideas with clarity and coherence, both written and verbally.
- Undertaking original research on a particular topic.
- To impart computer knowledge to enable them to calculate various mathematical concepts.

Academic Session 2021-22

CONTENT:

Scheme for M.Sc. Mathematics

Semester-I

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.

Academic Session 2021-22

1.	MHM-101	Real Analysis-I	75	25	100	75
2.	MHM-102	Algebra-I	75	25	100	75
3.	MHM-103	Applied Linear Algebra	75	25	100	75
4.	MHM-104	Number Theory	75	25	100	75
5.	MHM-105	Complex Analysis	75	25	100	75
6.	MHM-106	Differential Equations	75	25	100	75
Total			450	150	600	450

Semester-II

Sr. No.	**Course No.**	**Course Title**	**Theory Maximum Marks**	**Internal Assessment in theory**	**Total**	**Hrs.**

Academic Session 2021-22

1.	MHM-201	Real Analysis-II	75	25	100	75
2.	MHM-202	Algebra-II	75	25	100	75
3.	MHM-203	Probability Theory	75	25	100	75
4.	MHM-204	Classical Mechanics and Calculus of variations	75	25	100	75
5.	MHM-205	Differential Geometry	75	25	100	75
6.	MHM-206	Mathematical Methods	75	25	100	75
Total			450	150	600	450

Academic Session 2021-22

Semester-III

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	MHM-301	Measuer Theory	75	25	-	-	100	75
2.	MHM-302	Functional Analysis-I	75	25	-	-	100	75
3.	MHM-303	Statistical Inference	60	20	15	05	100	75
4.	MHM-304	Operations Research-I	75	25	-	-	100	75
5.	MHM-305	Discrete Mathematics-I	75	25	-	-	100	75
6.	MHM-306	Introduction to Computer and Information Technology	56	19	18	07	100	45
		Total	416	139	33	12	600	

Academic Session 2021-22

Semester-IV

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	MHM-401	Topology	75	25	-	-	100	75
2.	MHM-402	Functional Analysis-II	75	25	-	-	100	75
3.	MHM-403	Field Extension and Galois theory	75	25	-	-	100	75
4.	MHM-404	Operations Research-II	75	25	-	-	100	75
5.	MHM-405	Discrete Mathematics- II	75	25	-	-	100	75
6.	MHM-406	Programming in C	56	19	18	07	100	45
Total			431	144	18	07	600	

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-I)

COURSE CODE: Paper-MHM- 101

COURSE TITLE: REAL ANALYSIS-I

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of 5 questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- This course introduce students to the fundamentals of mathematical analysis .
- The objective of this course is to enable students to understand the concept of cardinality of a set, open sets, closed sets, compact sets and connected sets.
- Students wil realize how these notions are generalized from real line to metric spaces.

COURSE CONTENT:

Unit-I

Countable and uncountable sets. Metric spaces**:** Definition and examples, open sets, closed sets, Compact sets, elementary properties of compact sets.

Unit-II

Compactness of k- cells, Compact subsets of Euclidean space R^k. Heine-Borel theorem, Perfect sets,

The Cantor set, Separated sets, connected sets in a metric space, connected subsets of real line.

Unit-III

Academic Session 2021-22

Functions of Bounded Variation, Sequences in Metric Spaces**:** Convergent sequences (in Metric Spaces), subsequences, Cauchy Sequences, Complete metric spaces, Cantor's Intersection Theorem, Baire‟s theorem, Banach contraction principle.

Unit-IV

Continuity**:** Limits of functions (in metric spaces) Continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotonic functions, Uniform Continuity.

BOOKS PRESCRIBED:

1. Walter Rudin: Principles of Mathematical Analysis (3^{rd}Edition) McGraw- Hill td., Ch.2, Ch.3.
2. Simmons, G.F.: Introduction to Topology and Modern Analysis, McGraw-Hill Ltd. (App.1)
3. Shanti Narayan and P.K. Mittal : A Course of Mathematical Analysis.
4. S.C. Malik & Savita Arora: Mathematical Analysis, Wiley Eastern Ltd

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	introduces students to the fundamentals of mathematical analysis and reading and writing mathematical proofs.
CO2	Correlate Calculus with real analysis by finding infinite sums and evaluating limits to understanding the concept of continuity and uniform continuity one is doing real analysis.
CO3	understand the concept of cardinality of a set, open sets, closed sets, compact sets and connected sets, complete spaces, continuity and uniform continuity in a metric space.
CO4	Realizes how these notions are generalized from real line to metric spaces.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.-Mathematics (Semester-I)
COURSE CODE-MHM- 102

COURSE TITLE: ALGEBRA – I

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs

TIME: 3Hrs **MAXIUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of 5 questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- This course provides the foundation required for more advanced studies in Algebra which helps to develop the reasoning, logic and calculative ability in mathematics.
- Using group theory, Modern physics is based on symmetry principles and by the application of group theory the existence of several particles was predicted before they were experimentally observed.
- In chemistry, the symmetry of a molecule provides us with the information of what energy levels the orbital will be, what the orbital symmetries are, what transitions can occur between energy levels, even bond order and all of that is calculated using group theory.

COURSE CONTENT:

Unit-I

Groups, Subgroups, Equivalence relations and partitions, generators and relations,

Homomorphisms, Cosets, Normal subgroups, Simple groups, Quotient groups, Group actions, Lagrange's theorem, Conjugate elements, the Class equation, Isomorphism theorems, Cyclic Groups, Cauchy's theorem.

Unit-II

Composition series, the Jordan Holder theorem, Groups of automorphisms, Inner automorphisms, Symmetric groups, Alternating groups, Sylow's theorems, p-groups.

Academic Session 2021-22

Unit-III

Nilpotent groups, Simplicity of A_n ;$n \geq 5$, Cayley's theorem, the imbedding theorem, Commutator subgroup, Characteristic Subgroup, Solvable groups, Sequences of subgroups.

Unit-IV

Direct product and semi direct product of groups, Fundamental theorem of finitely generated abelian groups, Free groups, groups of symmetries, Groups of small order.

BOOKS PRESCRIBED:

1. Artin,. M : Algebra, Prentice-Hall, 1991
2. I.N. Herstein,: Topics in Algebra, 2nd edition, Wiley I
3. Dummit, D.S.: Abstract-Algebra, John-Wiley & Sons, Students Edition-1999 & Foote
4. Fraleigh, J. B.: An Introduction to Abstract Algebra.
5. P.B. Bhattacharya, S.K.Jain & S.R. Nagpaul : Basic Abstract Algebra, Cambridge University Press , 1997
6. Surjit Singh & Quazizamerrudin. Modern Algebra, Vikas Pub. House.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	recognize the foundation required for more advanced studies in Algebra.
CO2	use group theory in modern physics which is based on symmetry principles.
CO3	apply group theory such that the existence of several particles can be predicted before they are experimentally observed.
CO4	apply group theory in chemistry such as the symmetry of a molecule provides students with the information of energy levels of the orbital , the orbital symmetries bond order.
CO5	to develop the reasoning, logic and calculative ability in mathematics.

Academic Session 2021-22

KHALSA COLLEGE AMRITSAR
(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-I)
COURSE CODE: MHM- 103
COURSE TITLE: APPLIED LINEAR ALGEBRA
CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course will introduce the basic concepts of dual spaces and its general proofs.
- The course is designed to introduce the relationship of matrices and linear transformations and different classes of linear operators on inner product spaces and their structures.
- The course gives introduction of inner product spaces, orthogonal vectors, orthogonal sets and Gram Schmidt orthogonalization process.
- The course explains the concepts of bilinear and quadratic forms on vector spaces.

COURSE CONTENT:

Unit-I

Linear Functionals, Dual spaces and Dual basis, The double dual, Subspaces invariant under linear operators, Characteristic and minimal polynomials, Eigen values and Eigen Vectors of Linear Operators.

Unit-II

Triangulation, Diagonalization, Jordan canonical form, Generalized eigen vectors, canonical basis, rational canonical form.

Unit-III

Bilinear forms, Self-Adjoint Operators, Sylvester's theorem, quadratic forms, Hermitian forms.

Unit-IV

Inner Product Spaces, The Gram-Schmidt Orthogonalization, orthogonal complements. The Adjoint of a Linear operator on an inner product space, Normal and Unitary Operators, Spectral Theorem.

BOOKS PRESCRIBED:

1. Hoffman, K. and Kunze, R.: Linear Algebra, Second Edition, Prentice Hall,1971
2. Axler, S.: Linear Algebra Done Right, Second Edition, Springer- Verlag,1997
3. Friedberg, S.H.Insel,A.J, Spence, L.E. : Linear Algebra, Fourth Edition Prentice Hall, 2003
4. Lang, S.: Linear Algebra, Third edition Springer-Verlag, 1987.
5. Sahai, Vivek and Bist, Vikas: Linear Algebra, Narosa Publishing House, 2008

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	deepen their understanding of Linear Algebra.
CO2	become familiar with the concepts of linear independence, basis, span, linear maps, the properties of linear transformations and orthogonal decomposition of inner product spaces.
CO3	have a good knowledge of inner product spaces, and will be able to define and use the adjoint of a linear map on a finite-dimensional inner product space.
CO4	construct the matrix of a bilinear form and to find index, rank and signature of a bilinear form.
CO5	determine a linear operator is normal, unitary and orthogonal projection and to construct the spectral decomposition of normal and self-adjoint operators.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-I)

COURSE CODE: Paper-MHM- 104

COURSE TITLE: NUMBER THEORY

COURSE CREDIT (PER WEEK): 6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**

MEDIUM: English **(THEORY: 75**

INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.

1. The Section–A will consist of five compulsory questions each of one mark.
2. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
3. Question paper should cover at least 40% article work from the recommended books.
4. Teaching time for this paper will be eight periods per week.
5.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the various types of numbers and their properties.
- It will help the students to use various arithmetic functions and the concept of congruences to solve various arithmetic problems.
- Students will analyze the concept of continued fractions and Pythagorean triplets and insolvability of Diophantine equations.

COURSE CONTENT:

Unit-1

The sum of non negative divisors of an integer, Number of divisors of an integer, Multiplicative functions,Greatest Integer function, Mobius function,The Mobius Inversion formula, Euler's Phi- function and its properties.

Unit-II

Euler's theorem**,** The order of an integer modulo n, Primitive roots for primes, Composite Numbers having primitive roots, theory of indices and its application to solving congruences.

Unit-III

Quadratic residue modulo a prime, Euler's criterion, The Legendre symbol and its properties, Gauss Lemma, Quadratic reciprocity law, Jacobis symbol and its Properties, Pythagorean

triplets, Insolvability of Diophantine equation $x^4 + y^4 = z^4$, $x^4 - y^4 = z^2$ in positive integers.

Unit-IV

Representation of an integer as a sum of two squares and sum of four squares, finite and infinite simple continued fractions, Convergence of a continued fraction and their properties, Pell's equations.

BOOKS PRESCRIBED:

1. David M. Burton: Elementary Number Theory, Mc Graw Hill 2002.
2. G.H.Hardy and E.M.Wright : An Introduction to the Theory of Numbers, Oxford Univ. Press.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Form the bridge between pure mathematics and applied mathematics.
CO2	Apply Number Theory in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
CO3	understand the various types of numbers and their properties.
CO4	use various arithmetic functions and the concept of congruences to solve various arithmetic problems.
CO5	Analyze the study of integers and integer-valued functions.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.-Mathematics (Semester-I)
COURSE CODE: MHM- 105

COURSE TITLE: COMPLEX ANALYSIS

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM: English INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Complex analysis is useful in many branches of mathematics, including algebraic geometry, number theory, analytic combinatorics; as well as in physics, including the branches of hydrodynamics, thermodynamics, and particularly quantum mechanics.
- The content of this course is designed to make the students understand the properties of analytic functions, concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

COURSE CONTENT:

Unit-I

Functions of complex variables, limit, continuity and differentiability, Analytic functions, Conjugate function, Harmonic function. Cauchy Riemann equations (Cartesian and Polar form).
Construction of analytic functions.

Unit-II

Complex line integral, Cauchy's theorem, Cauchy's integral formula and its generalized form. Cauchy's inequality. Poisson's integral formula, Morera's theorem. Liouville's theorem. Power
Series and it's circle of convergence.

Unit-III

Taylor's theorem, Laurent's theorem, Zeros & Singularities of an analytic function, Residue at a pole and at infinity, Cauchy's Residue theorem, Integration round Unit circle. Evaluation of integrals of the form $\int_{-\infty}^{\infty} f(x)dx$

Unit-IV

Jordan's lemma, Fundamental theorem of algebra, argument principle, Rouche's theorem, conformal transformation, Bilinear transformation, critical points, fixed points, cross ratio, problems on cross ratio and bilinear transformations

BOOKS PRESCRIBED:

1. Copson, E.T .:Theory of functions of complex variables.
2. Ahlfors, D. V.:Complex analysis.
3. Titchmarsh, E.C.:Theory of functions of a complex variable.
4. Conway, J.B.:Functions of one complex variable

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	understand the properties of analytic functions.
CO2	to understand the concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-I)

COURSE CODE: Paper-MHM- 106

COURSE TITLE: DIFFERENTIAL EQUATIONS

COURSE CREDIT (PER WEEK):6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours (THEORY: 75

MEDIUM: English INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Studemts will be abl to know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
- Students will understand properties of solutions of differential equations is fundamental to much of contemporary science and engineering.
- Ordinary differential equations (ODE's) will help the students to deal with functions of one variable, which can often be thought of as time.

COURSE CONTENT:

Unit-I

Existence and uniqueness theorem for solution of the equation $dx/dy = f(x,y)$, the method of successive approximation, general properties of solution of linear differential equation of order n, adjoint and self-adjoint equations. Total differential equations. Simultaneous differential equations.

Unit-II

Sturm Liouville's boundary value problems. Sturm comparison and Separation theorems. First order PDE's., Integral surface through a given curve. Surface orthogonal to given system of surfaces.

Unit-III

Non linear PDE's of first order. Charpit's method and Jacobi's method, PDE's of the 2^{nd} order. Linear PDE's with constant coefficients. Second order PDE's with variable coefficients and their classification.

Unit-IV

Non-linear PDE's of second order, Monge's Method. Solution of linear hyperbolic equation, Solution of Laplace, wave and diffusion equations by method of separation of variables.

BOOKS PRESCRIBED:

1. Piaggio, H.T.H.: Differential equations.
2. Ross, S.L.: Differential equations.
3. Sneddon, I : Elements of partial differential equation

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	learn to express laws of nature with the help of differential equations.
CO2	know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
CO3	to focus on the equations and techniques most useful in science and engineering.
CO4	Understand properties of solutions of differential equations is fundamental to much of contemporary science and engineering.
CO5	learn to formulate, classify and transform first order partial differential equation into canonical forms.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-II)

COURSE CODE: Paper-MHM- 201

COURSE TITLE: REAL ANALYSIS –II

CREDIT HOURS (PER WEEK): 6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**

MEDIUM: English **(THEORY: 75**

INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course objective is to enable students to understand Riemann Stieltjes integrability of a bounded function.
- Students will recognize the difference between pointwise and uniform convergence of sequence and series of functions.
- Students will be familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
- Students will analysis the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.

COURSE CONTENT:

Unit I

The Riemann Stieltje's Integral: Definition and existence of Riemann Stieltje's integral, Properties of integral. Integration and Differentiation. Fundamental Theorem of Calculus, Ist and 2^{nd} Mean Value Theorems of Riemann Stieltje's integral.

Unit II

Integration of vector valued functions, Sequence and Series of functions: Uniform Convergence, Uniform Convergence and continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation.

Unit III

Equicontinuous families of functions, Arzela's Theorem, Weierstrass Approximation theorem. The Stone-Weierstrass theorem.

Unit IV

Power series : Radius of convergence, properties, Abel's Theorem, Taylor's Theorem
Fourier series :Convergence, Riemann Lebesgue Lemma, Bessel's inequality, Parseval's Equality.

BOOK PRESCRIBED:

1.Walter Rudin: Principles of Mathematical Analysis (3rd edition) Mc Graw Hill Ltd.Ch.6,Ch.7,Ch.8, Ch.9(9.1-9.8).
2.S.C.Malik & Savita Arora: Mathematical Analysis, Wiley Eastern Ltd.,
3. Shanti Narayan & P.K. Mittal : A Course of Mathematical Analysis, S.Chand & Co.
4. Apostol, T.M. : Mathematical Analysis 2nd Edition Theorem (7.18, 7.30 & 7.31).

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	studies the behavior of sequences and series of functions.
CO2	Get familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
CO3	Analyzes the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.
CO4	understand Riemann Stieltjesintegrability of a bounded function and prove a selection of theorems concerning integration.
CO5	recognize the difference between pointwise and uniform convergence of sequence and series of functions, Equicontinuous families of functions, Arzela Ascoli's theorem and Weierstrass Approximation Theorem .

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.-Mathematics (Semester-II)

COURSE CODE: Paper-MHM- 202

COURSE TITLE: ALGEBRA -II

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM: English INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Ring Theory is an extension of Group Theory, wide areas of current research in mathematics, computer science
- and mathematical/theoretical physics.
- To introduce the concepts and to develop working knowledge on simple ring and ring homomorphism.
- Ring theory studies the structure of rings, their representations, modules, special classes of rings (group rings, division rings, and universal enveloping algebras).
- Ring theory, which provide many developments of commutative ring theory, which is now, under the name of commutative algebra, a major area of modern mathematics.

COURSE CONTENT:

Unit I

Rings, Subrings, Ideals, Factor Rings, Homomorphisms, Integral Domains. Maximal and prime ideals. The field of quotients of an integral domain, Chinese remainder theorem, Simple rings, Ideals of Matrix rings.

Unit-II

Principal Ideal domains, Euclidean Rings. The ring of Gaussian Integers, Unique factorization domains, Gauss lemma, Polynomial rings, Division algorithm, factorization in polynomial rings over unique factorization domains.

Unit-III

Modules, Submodules, free modules, quotient modules, Homomorphism theorems, Direct sums, Finitely generated modules, Simple modules, Cyclic modules, Differences between modules over rings and vector spaces.

Unit-IV

Modules over PID's, Structure theorem of modules over PID's. Torsion module, Torsion free modules, Artinian and Noetherian modules, Artinian and Noetherian rings, module of finite length.

BOOKS PRESCRIBED:

1. Fraleigh, J. B.: A first course in Abstract Algebra 7^{th} edition, Narosa Publishing House, New Delhi.
2. Singh ,S. and Zameeruddin ,Q.: Modern Algebra, Vikas Publishing House, New Delhi.
3. Dummit, D.S. & Foote, R.M. : Abstract-Algebra, John-Wiley & Sons, Students Edition-1999
4. Bhattacharya, P.B.,Jain, S.K., Nagpal, S.R. : Basic Abstract Algebra, Cambridge University Press, 1997.
5. Musili, C.: Rings and Modules, Narosa Publishing House, New Delhi, 1994.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Use ring theory in wide areas of current research in mathematics, computer science and mathematical/theoretical physics.
CO2	introduce themselves with the concepts and develop working knowledge on simple ring and ring homomorphism.
CO3	know the structure of rings, their representations, modules, special classes of rings (group rings, division rings, and universal enveloping algebras).
CO4	Deal with developments of commutative ring theory, which is a major area of modern mathematics.
CO5	appreciate the significance of unique factorization in rings and integral domains.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-II)

COURSE CODE-MHMH- 203

COURSE TITLE: PROBABILITY THEORY

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM: English INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III, IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.
6. Use of Non-programmable Scientific calculator is allowed.

COURSE OBJECTIVES:

- The main objective of this course is to provide students with the foundation of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction networks etc.
- With this course learner will have good understanding of exploratory data analysis.
- Students will learn the differences between discrete distributions and continuous distribution.

COURSE CONTENT:

Unit-I

Classical and axiomatic approach to the theory of probability, additive and multiplicative law of probability, conditional probability and Baye's theorem. Random variable, probability mass function, probability density function, cumulative distribution function, distributions of functions of random variable.

Unit-II

Two and higher dimensional random variables and their functions, joint distribution, marginal and conditional distributions, Bivariate and multivariate transformation of random variable, Stochastic independence. Mathematical expectations, moments, moment generating function, Characteristic function, Chebyshev's and Cauchy Schwartz Inequality.

Unit-III

Discrete Distributions: Uniform, Binomial, Poisson, Geometric, Hyper geometric, Multinomial. Continuous Distributions: Uniform, Exponential, Normal distributions, Gamma distribution, Beta distribution.

Academic Session 2021-22

Unit-IV

Chi-square distribution, t-distribution, F distribution, sampling distribution of mean and variance of sample from normal distribution. Convergence in probability and convergence in distribution, central limit theorem (Laplace theorem Linderberg, Levy's Theorem). Probability generating function.

BOOKS PRESCRIBED:

1. Hogg, R.V., Mckean, J.W. and Craig, A.T. : Introduction to Mathematical Statistics.
2. Rohtagi; V.K. and Ehsanes: Introduction to Probability and Statistics.
3. Casella, G. and Berger, R. L.: Statistical Inference.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	acquaint with the foundation of probabilistic and statistical analysis ,mostly used in engineering and science like disease modeling, climate prediction networks etc.
CO2	take informed decisions about a population by examining only a small random sample of the members of that population.
CO3	quantify the uncertainty and assess the accuracy of our inference about the population.
CO4	have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set.
CO5	become informed consumer of statistical information provided in newspaper, magazine and journals.

.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-II)

COURSE CODE: Paper-MHM- 204

COURSE TITLE: CLASSICAL MECHANICS AND CALCULUS OF VARIATIONS

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs
TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course will introduce the concepts of Lagrange's equation for holomonic and non holomonic constraints.
- The course is designed to introduce the applications of Lagrange's formulation and generalized coordinates.
- The course gives introduction of fundamental problems of calculus of variations and variational problems with moving boundaries.
- The course explains the concepts of variation of a functional and its properties.

COURSE CONTENT:

Unit-I

Generalized co-ordinates and generalized velocities, virtual work, generalized forces, Lagrange's equations for a holonomic dynamical system, conservative system, holonomic dynamical system for impulsive forces and their applications.

Unit-II

Kinetic energy as a quadratic function of velocities, theory of small oscillations, Functional, variation of functional and its properties, fundamental lemma of calculus of variation, Euler's equations, necessary and sufficient conditions for extremum, The Brachistochrone problem, Functionals dependent on higher order derivatives and several dependent variables.

Unit-III

Variational problems with fixed boundaries, Transversality conditions, Orthogonality conditions, Sturm-Liouville's theorem on extremals, one sided variations, Hamilton's principle, The

principle of least action, Langrange's equations from Hamilton's principle.

Unit-IV

Variational Methods: Direct Methods, Euler's finite difference method, The Ritz method, Kantorovich Method for Boundary value problems in ODE's & PDE's, Isoperimetric Problems.

BOOKS PRESCRIBED:

1. Chorlton, F.: Text Book of Dynamics.
2. Elsgolts, L: Differential Equations and the Calculus of Variations.
3. Gelfand,I.M. and Fomin, S.V.: Calculus of Variations.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	apply the classical mechanics approach to solve a mechanical problems.
CO2	understand the concept of functional and determine stationary paths of a functional to deduce the differential equation for stationary paths.
CO3	describe and understand the motion of a mechanical system using Lagrange Hamilton formalism.
CO4	recognize the degrees of freedom and understand the concept of generalized coordinates.
CO5	apply the concepts of classical mechanics in Geology, engineering, and many other inter-disciplinary areas.

Academic Session 2021-22

Khalsa College Amritsa

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-II)

COURSE CODE: Paper-MHM- 205

COURSE TITLE: DIFFERENTIAL GEOMETRY

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
(THEORY: 75
INTERNAL ASSESSMENT:25)

TIME: 3Hrs
MEDIUM: ENGLISH

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A, which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Differential geometry have many applications in different fields. In computer vision (used to analyze shapes), in engineering (to solve problems in digital signal processing), in economics (to the field of econometrics) and in chemistry and biophysics (in modeling cell membrane structure under varying pressure).
- The aim of this course is to get the students familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals, the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

COURSE CONTENT:

Unit – I

Curve in R^3 : A simple arc, curves and their parametric representation, arc length Contact of curves, tangent line, principal normal, binormal, osculating plane, normal plane, rectifying plane.

Unit – II

Curvature and torsion, Serret-Frenet Formule, Helics, Evolute and Involute of a parametric curve, spherical curves. osculating circles and spheres.

Unit-III

Einstein's summation convention, Transformation of coordinates, tensors law for transformation, contra variant, covariant and mixed tensors, Addition, outer product, contraction, inner product and quotient law of tensors, metric tensor and Riemannian metric, Christoffel symbols, Covariants, differentiation of tensors.

Unit-IV

Surfaces in R^3: Implicit and Explicit forms for the equation of the surface, the two fundamental

forms of a surface, Family of surfaces, Edge of regression, Envelops, Ruled surface, Developable and skew surfaces, Gauss and Weingarten formulae.

BOOKS PRESCRIBED:

1. A. Pressley: Elementary Differential Geometry, Springer, 2005.
2. T.J.Willmore: Introduction to Differential Geometry
3. Martin M. Lipschutz: Differential Geometry
4. U.C. De; A.A. Shaikh & J. Sengupta: Tensor Calculus
5. M.R. Spiegel: Vector Analysis
6. D. Somasundaram: Differential Geometry – A First course, Narosa Publishing House

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals.
CO2	know the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

Academic Session 2021-22

Khalsa College Amritsa

(An Autonomous College)

Syllabus for

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-II)

COURSE CODE: Paper-MHM- 206

COURSE TITLE: MATHEMATICAL METHODS

COURSE CREDIT (PER WEEK):6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM -English **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The objective of this course is to provide students an understanding of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
- The concept of Volterra and Fredholm integral equations and solutions of these equations using various methods.

COURSE CONTENT:

Unit-I

Laplace Transform: Definition, existence and basic properties of the Laplace transform, Inverse Laplace transform, Convolution theorem, Laplace transform solution of linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit-II

Fourier Transform: Definition, existence, and basic properties, Convolution theorem, Fourier transform of derivatives and Integrals, Fourier sine and cosine transform, Inverse Fourier transform, solution of linear ordinary differential equations and partial differential equations.

Unit-III

Volterra Equations: Integral equations and algebraic system of linear equations. Volterra equation, L_2 –kernels and functions. Volterra equations of first & second kind. Volterra integral equations and

linear differential equations.

Unit-IV

Fredholm equations, solutions by the method of successive approximations. Neumann's series, Fredholm's equations with Pincherte-Goursat Kernels.

BOOKS PRESCRIBED:

1. Tricomi, F.G. : Integral Equation (Ch. I and II) Kanwal R, P :
2. Kanwal R. P: Linear Integral Equations
3. S.G. Mikhlin: Integral Equations
4. Pinckus, A. and Zafrany, S.: Fourier Series and Integral Transforms

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	prepare themselves with mathematical tools and techniques that are required in advanced courses offered in the applied mathematics and engineering problems.
CO2	apply concept of mathematical methods in diverse areas of science and technology such as electric analysis, communication engineering,solution of partial differential operation.
CO3	learn to solve the Integral equations which are encountered in various problems including radiative transfer, and the oscillation of a string, membrane, or axle.
CO4	Understand the concept of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
CO5	interpret the concept of Volterra and Fredholm integral equations and find solutions of these equations using various methods.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: Paper-MHM- 301

COURSE TITLE: MEASURE THEORY

COURSE CREDIT (PER WEEK):6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
(THEORY: 75
INTERNAL ASSESSMENT: 25)

TIME: 3Hours
MEDIUM -English

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- It gives a natural extension of Riemann integral which allows for better understanding of the fundamental relations between differentiation and integration.
- Measure Theory, along with the associated theory of (Lebesgue) integration, has important applications in many areas, including Functional Analysis, Harmonic Analysis, Dynamical systems and Probability Theory.
- The theory makes rigorous the notions of length, area and volume, and generalises these notion and also, give the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.

COURSE CONTENT:

Unit-I

Lebesgue Outer Measure & Measurable Sets and their properties, Non Measurable Sets, Outer and Inner Approximation of the Lebesgue Measurable Sets, Borel Sigma Algebra and The Lebesgue Sigma Algebra, Countable Additivity, Continuity and the Borel-Cantelli Lemma.

Unit-II

The motivation behind Measurable Functions, various Characterizations and Properties of Measurable functions: Sums, Products and Compositions Sequential Pointwise Limits and

Simple Approximations to Measurable Functions. Littlewood‟s three principles. Lebesgue Integral: Lebesgue Integral of a simple function and bounded measurable function over a set of finite measure. Comparison of Riemann and Lebesgue Integral. Bounded Convergence Theorem, Integral of a non-negative measurable function, Fatou‟s Lemma, Monotone Convergence Theorem.

Unit-III

General Lebesgue Integral, Lebesgue Dominated Convergence Theorem, Countable Additivity and Continuity of Integration, Vitali Covers and Differentiability of Monotone Functions, Functions of Bounded Variation, Jordan's Theorem, Absolutely Continuous Functions, Absolute Continuity and the Lebesgue Integral.

BOOKS PRESCRIBED:

1. Royden,H.L and P.M. Fitzpatrik; Real Analysis (Fourth Edition), Pearson Education Inc.New Jersey, U.S.A (2010).

2. R.A. Gordon, The integrals of Lebesgue, Denjoy, Perron and Henstock, Amer. Math.Soc.

Province, RI, (1994).

3. Barra, G De: Introduction to Measure Theory, Van Nostrand and Reinhold Company.

4. Jain, P.K. ,Gupta, V.P. and Pankaj Jain : Lebesgue Measure and Integration, New Age International Publishers.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Use concepts of mathematical analysis to determine the sizes of sets.
CO2	Know about natural extension of Riemann integral which allows for better understanding of the fundamental relations between differentiation and integration.
CO3	Apply Lebesgue integration in many areas, including Functional Analysis, Harmonic Analysis and Probability Theory.
CO4	acquire the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.
CO5	extend the concept of outer measure in an abstract space.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: Paper-MHM- 302

COURSE TITLE: FUNCTIONAL ANALYSIS-I

CREDIT HOURS (PER WEEK): 6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM -English **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

6. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
7. The Section–A will consist of five compulsory questions each of one mark.
8. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
9. Question paper should cover at least 40% article work from the recommended books.
10. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The objective of this course is to provide the main concepts and fundamental methods of functional analysis to enable a student to treat various concrete problems based on Banch spaces, Hilbert spaces etc.
- It studies the certain classes of functions defined in functional spaces.
- It plays vital role in study of existence and uniqueness of solutions of differential equations, boundary value problems, optimization techniques etc.

COURSE CONTENT:

Unit-I

Normed linear spaces, Banach spaces, subspaces, quotient spaces. Continuous linear transformations, equivalent norms.

Unit-II

Finite dimensional normed linear spaces and compactness, Riesz Lemma, The conjugate space N*. The Hahn-Banach theorem and its consequences. The natural imbedding of N into N**, reflexivity of normed spaces.

Unit-III

Open mapping theorem, projections on a Banach space, closed graph theorem, uniform boundedness principle, conjugate operators. L_P -spaces: Holder's and Minkowski,s inequalities, completeness of L_P-spaces.

BOOKS PRESCRIBED:

1 .G.F. Simmons: Introduction to Topology and Modern Analysis, Ch. 9, Ch.10 (Sections 46 - 51), Mc.Graw-Hill International Book Company, 1963.
2. Royden, H. L. & P.M. Fitzpatrik: Real Analysis, Ch 6 (Sections 6.1 -6.3), Macmillan Co. 1988.
3. Erwin Kreyszig : Introduction. to Functional Analysis with Applications John Wiley & Sons,1978.
4. Balmohan V. Limaye: Functional Analysis, New Age International Limited.
5 .P.K.Jain and O.P Ahuja : Functional Analysis, New Age International (P) Ltd Publishers, 2010
6. K. Chanrashekhra Rao : Functional Analysis, Narosa, 2002
7. D. Somasundram: A First Course in Functional Analysis, Narosa, 2006

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Learn the main concepts and fundamental methods of functional analysis to treat various concrete problems based on Banach spaces.
CO2	study the certainclasses of functions defined in functional spaces.
CO3	learn the various examples of banach spaces.
CO4	verify the requirements of a norm and completeness with respect to a norm.
CO5	compute the spectrum of operators and classify the set into sub-classes.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: Paper-MHM-303

COURSE TITLE: STATISTICAL INFERENCE

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 60**
INTERNAL ASSESSMENT: 20)
(PRACTICAL: 15
INTERNAL ASSESSMENT: 05)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions by selecting at least three questions from each section. Each question will carry 5.5 marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.
6. Use of Non-programmable scientific calculator is allowed.

COURSE OBJECTIVES:

- To understand the concept of estimation of parameters.
- To get familiar with testing of hypothesis.
- To learn the use of various statistical tests to solve practical problems.

COURSE CONTENT:

Unit-I

Point Estimation: Sufficient statistics, Neyman factorization theorem, minimal sufficient statistics, ancillary statistics, complete statistics, Basu's theorem, unbiasedness, consistency, efficiency, Minimum variance unbiased estimators, Rao Blackwell Theorem, Lehmann-Scheffe theorem.

Unit II

Cramer-Rao lower bound. Efficiency of an estimator. Methods of estimation: maximum likelihood estimator, properties of MLE(without proof) method of moments, Bayes estimator, Concepts of testing of hypotheses, critical region, test function, two types of errors, power function, level of significance, p-value.

Unit-III

Neyman-Pearson theory, M.P. test, UMP test, Likelihood ratio property, Karlin Rubin theorem, Likelihood tests (excluding properties of Likelihood Ratio Tests). Tests based on t, chi square and F distributions. Large sample tests.

BOOKS PRESCRIBED:

1. Hogg, R.V., Mckean,,J.W.and Craig,A.T: Introduction to Mathematical Statistics
2. Casella,G.and Berger, R.L. Statistical Inference.
3. Rohtagi; V.K. and Ehsanes: Introduction to Probability and Statistics.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Solve the problems based on estimation and to test the efficiency of various estimators.
CO2	Handle the practical problems using hypothesis testing.
CO3	Solve the practical problems using t-test, F-test, Z-test, chi-square test for various types of data.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: MHM- 304

COURSE TITLE: OPERATIONS RESEARCH-I

CREDIT HOURS (PER WEEK): 6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUNMARKS: 100**

MEDIUM: **English** **(THEORY: 75**

INTERNAL ASSESSMEN: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course will introduce the graphical solutions of linear programming problems with two variables, and illustrate the concept of convex set and extreme points.
- The course is designed to introduce the relationships between the primal and dual problems, and to understand sensitivity analysis.
- The course gives introduction of simplex method.
- The course explains the detailed procedure of transportation, assignment and two-person zero-sum game problems.

COURSE CONTENT:

Unit-I

Mathematical formulation of linear programming problem, properties of a solution to the linear programming problem, generating extreme point solution, simplex computational procedure, development of minimum feasible solution, the artificial basis techniques, a first feasible solution using slack variables, two phase and Big-M method with artificial variables.

Unit-II

General Primal-Dual pair, formulating a dual problem, primal-dual pair in matrix form, Duality theorems, complementary slackness theorem, duality and simplex method, economic interpretation of primal-dual problems. The General transportation problem, transportation table, duality in transportation problem, loops in transportation tables, linear programming formulation, solution of transportation problem, test for optimality, degeneracy, transportation algorithm (MODI method), time minimization transportation problem.

Unit-III

Assignment Problems: Mathematical formulation of assignment problem, the assignment method, typical assignment problem, the traveling salesman problem. Game Theory: Two-person

zero sum games, maximin-minimax principle, games without saddle points (Mixed strategies), graphical solution of $2 \times n$ and $m \times 2$ games, dominance property, arithmetic method of $n \times n$ games, general solution of $m \times n$ rectangular games.

BOOKS PRESCRIBED:

1. Gass, S. L.: Linear Programming
2. Hadley, G.: Mathematical Programming
3. Kambo, N. S.: Mathematical Programming
4. Kanti Swarup, Gupta, P.K. & Man Mohan: Operations Research
5. R.Panneerselvam: Operations Research
6. Taha, H. A. Operations Research

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	understand special situations such as redundancy, infeasibility, unboundedness and alternate optimal solutions in linear programming problems.
CO2	acquire quantitative, analytical tools to support decision making in the optimization of economic processes.
CO3	develop the functional mathematical relationship that describe decision variables, objective function, constraints of the problem and non-negativity conditions.
CO4	decide optimum allocation of various limited resources to arrive at the optimum decision by using various techniques like assignment, transportation problems etc.
CO5	extend their knowledge of basic optimization techniques to do interesting research work on these types of optimization techniques.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: Paper-MHM- 305

COURSE TITLE: DISCRETE MATHEMATICS-I

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 60 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To gain knowledge about computing and mathematics appropriate to the discipline.
- To learn sets and its operations and represent using Venn diagram.
- To represent the problem using propositional logic and convert it as gates and truth table.
- To visualize the given problem as graphs and tree representation.
- To apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

COURSE CONTENT:

Unit-I

Mathematical Logic: Properties and logical operations, Truth tables, Logical connections, Logically equivalent statements, tautology and contradiction, algebra of propositions, argumentsm, duality law. Quantifiers, inference rules for quantified statements, Predicate calculus, inference theory of predicate logic, valid formula involving quantifiers.

Unit-II

Boolean algebra**:** Boolean algebra and its properties, principle of duality in Boolean algebra, isomorphism, partial order, Boolean switching circuits, equivalence of two circuits, simplification of circuits, Boolean polynomial, Boolean expression & function, Fundamental forms of a Boolean function. Disjunctive normal form, Complement function of a Boolean function.

Unit-III

Lattices and Graph theory: Partial ordered sets, Hasse diagrams, isomorphism, lattices, lattices as algebraic system, sub-lattices, direct product and homomorphism. Simple graphs, multi graphs, incidence and degree, regular graph, isolated vertex, pendent vertex, null graph, Diagraph, connected graph, bipartite graph, isomorphisms, Eulerian graphs, Planar and dual graph, planner graph representations.

BOOKS PRESCRIBDED:

1. Trambley, J.P. and Manohar,R: Discrete Mathematical Structures with Applications to Computer Science.
2. Liu C.L.: Elements of Discre.te Mathematics.
3. Alan Doerr and Kenneth Leasseur: Applied Discrete Structures for Computer Science
4. Seymour Lipschutz: Discrete Mathematics, Schaum's outline series, Mc-Graw Hill Education.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	apply laws of set theory, recurrence relations, grammar and language, logic and propositional calculus in various fields of computer science, electronic engineering and medical sciences.
CO2	learn Grammar as an algebraic system that describes the process by which instances of a language can be constructed.
CO3	Understand mathematical structure for accepting or rejecting strings (words) in a language.
CO4	explore and apply the basic method in subsequent courses in the design and analysis algorithms, computability theory and software engineering.
CO5	Apply the concepts of discrete mathematics in analyzing, designing and simplifying electronic devices including digital computer, dial telephone, switching system and different kind of control devices.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-III)

COURSE CODE: Paper- MHM-306

COURSE TITLE: Introduction to Computers and Information Technology

CREDIT HOURS (PER WEEK): T4+P2.6

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 100

TIME: 3 hours **(THEORY MARKS: 56**

MEDIUM: ENGLISH **INTERNAL ASSESSMENT THEORY MARKS: 19**

PRACTICAL MARKS: 18

PRACTICAL INTERNAL ASSESSMENT MARKS: 07)

INSTRUCTIONS FOR PAPER SETTER:

Note: The question paper covering the entire course shall be divided into three sections.

Section A: It will have question No.1 consisting of 10 very short answer questions from the entire syllabus. Students will attempt 6 questions. Each question will carry two marks with answer to each question up to 10 lines in length. The total weightage being **12 marks**.

Section B: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 2, 3, 4 and 5 will be set by the examiner from Unit-I of the syllabus. The students will be required to attempt any two questions. Each question will carry 11 marks.
The total weightage of this section shall be **22 marks.**

Section C: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 6, 7, 8 and 9 will be set by the examiner from Unit-II of the syllabus. The students will be required to attempt any two questions. Each question will carry 11 marks.
The total weightage of this section shall be **22 marks**.

COURSE OBJECTIVES:

- To familiarize the various parts of computer.
- To study application of computers in different fields.
- To recall the evolution of computers through various generation.
- To acquire the knowledge of working of input and output devices.
- To impart the knowledge of operating system and its types.
- Hands on practice of MS office software.

COURSE CONTENT:

UNIT-I

Introduction to Computers and its Applications:

Academic Session 2021-22

Computer definition and its characteristics, Block diagram of a computer, Evolution of Computers, Classification of Computers: Based on Generation, Based on Size (Micro, Mini, Mainframe, Super, Notebook, Personal Computer, Workstation) ,Based on Data Processing Techniques (Analog, Digital and Hybrid Computers)
Batch oriented/on line/real-time applications
Applications of Computer
Interacting with the Computer:
Input Devices: Keyboard, Mouse, pens, Touch screens, Bar Code reader, Joystick, Source data automation, (MICR, OMR, OCR), Screen assisted data entry: portable / handheld terminals for data collection, vision input systems.
Output Devices: Monitor, Printers (Line, Character, Page), plotters, voice response units.

UNIT-II

Data Storage Devices and Media: Primary storage (Storage addresses and capacity, types of memory), Secondary storage, Magnetic storage devices and Optical storage devices.

MS–Word 2010: Overview, creating, saving, opening, importing, exporting and inserting files, formatting pages, paragraphs and sections, indents and outdents , creating lists and numbering. Headings, styles, fonts and font size editing, positioning and viewing texts, Finding and replacing text, inserting page breaks, page numbers, book marks, symbols and dates. Using tabs and tables, header, footer and printing, mail merge, macros.
MS-Excel2010: Worksheet overview. Entering information. Worksheet creation. Opening and saving workbook. Formatting number and texts. Protecting cells. Producing Charges and printing operationsgraphs.

BOOKS PRESCRIBED:

1. Computer Fundamentals – P.K. Sinha.
2. Introduction to Computers – N. Subramanian.
3. Introduction to Computers – Peter Norton Mcgraw Hill.
4. MS–Office _ BPB Publications.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Acquire the computer terminology
CO2	Gain insight of working of input and output devices.
CO3	Develop skills of working with MS-Word, MS-PowerPoint, MS-excel.
CO4	Possess the knowledge of importance of operating system in computer.
CO5	Understand the concept of storing of data in memory and its types.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.-Mathematics
(Semester-IV)
COURSE OUTCOMES: Paper-MHM- 401

COURSE TITLE: TOPOLOGY

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM -ENGLISH INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- In chemistry one can discuss the shape of molecules by analysis of the topology of a related graph. On the other hand, topology provides mathematical tools that are useful to applied mathematicians and to theoretical physicists.
- Also topology will be very useful in computers specially in network science.
- The content of this course is designed to make the students understand the various topological spaces and their properties, separation axioms, Tietz extension theorem and Tychnoff theorem

COURSE CONTENT:

Unit-I

Topological spaces, Continuous functions, Homeomorphisms, definition of Product spaces and quotient spaces, Topological groups.

Unit-II

Connectedness, Intermediate value theorem and uniform limit theorem, Local connectedness,Compactness,Finite Intersection Property (F.I.P.), Cantor‟s intersection theorem, Uniform continuity, Bolzano-Weierastrass Property, Local compactness.

Unit-III

Countabilityand separation axioms, Hausdorff spaces, Regular Spaces, Normal spaces, Urysohn's Lemma, Completely regular spaces, Metrizable topological spaces, Urysohn's Metrization Theorem,

The Tietze extension theorem, Completely normal spaces,The Tychonoff Theorem.

BOOKS PRESCRIBED:

1. J. R. Munkres : Topology, Prentice Hall of India, 2007 (Indian reprint)
2. J. L. Kelley : General Topology, 2008 (Indian reprint).
3. K. Janich, Topology, Springer-Verlag, 2004.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Learn the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending.
CO2	discuss the shape of molecules in chemistry by analysis of the topology of a related graph.
CO3	Understand the mathematical tools that are useful to applied mathematicians and to theoretical physicists.
CO4	Apply the knowledge of topology in computers specially in network science.
CO5	understand the various topological spaces and their properties, separation axioms, Tietz extension theorem and Tychnoff theorem.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-IV)
COURSE CODE: Paper-MHM- 402
COURSE TITLE: Functional Analysis II

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 60 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM -ENGLISH INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week

COURSE OBJECTIVES:

- The objective of this course is to provide the main concepts and fundamental methods of functional analysis to enable a student to treat various concrete problems based on Banch spaces, Hilbert spaces etc.
- It studies the certain classes of functions defined in functional spaces.
- It plays vital role in study of existence and uniqueness of solutions of differential equations, boundary value problems, optimization techniques etc.

COURSE CONTENT:

Unit -I

Inner product spaces, Hilbert spaces, orthogonal complements, orthonormal sets, the conjugate space H*.

Unit-II

Strong and weak convergence in finite and infinite dimensional normed linear spaces. Weak convergences in Hilbert spaces, weakly compact set in Hilbert spaces, The adjoint of an operator, self adjoint operators, positive operators, normal operators, Unitary operators.

Unit-III

Projections on a Hilbert space, Spectral Theorem for normal operators, Compact linear operators on normed spaces, properties of Compact linear operators.

BOOKS PRESCRIBED:

1. Simmon G.F.:Introduction to topology and Modern Analysis Ch.X (sections 52-59) Ch. XI (Sections 61-62) Mc Graw- Hill (1963) International Book Company.
2. Erwin Kreyszig: Introduction to Functional Analysis with Applications, John Wiley & Sons (1978).
3. Limaye, Balmohan V.: Functional Analysis, New Age International Limited, 1996.
4. Jain, P.K. & Ahuja, O.P.: Functional Analysis, New Age International (P) Ltd. Publishers, 2010
5. Chandrasekhra Rao, K.: Functional Analysis, Narosa, 2002.
6. Somasundram, D.: A First Course in Functional Analysis, Narosa, 2006.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Learn the main concepts and fundamental methods of functional analysis to enable a student to treat various concrete problems based on Hilbert spaces .
CO2	Study functional spaces which play vital role in study of existence and uniqueness of solutions of differential equations, boundary value problems, optimization techniques etc.
CO3	distinguish between Banach spaces and Hilbert spaces.
CO4	classify operators into self-adjoint, unitary and normal operators.
CO5	represent a bounded linear functional in terms of inner product.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-IV)

COURSE CODE: Paper-MHM- 403

COURSE TITLE: FIELD EXTENTIONS AND GALOIS THEORY

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**

MEDIUM: English **(THEORY: 75**

INTERNAL

ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To understand the concept of finite and infinite fields.
- To get familiar with various field extensions such as simple extension, separable extensions etc.
- To learn the formation of finite fields.
- To get familiar with Galois Theory.
- To have an idea of construction of various geometrical figures using ruler and compass.

COURSE CONTENT:

Unit-1

Fields, characteristic of a field, prime fields, finite field extensions, degree of field extension, Algebraic extensions, splitting fields: Existence and Uniqueness, Algebraic closure, Algebraically closed fields.

Unit –II

Finite fields, Existence of $GF(p^n)$, Construction of finite fields, Separable and purely inseparable extensions, Perfect fields, Simple extentions, Primitive elements, Lagrange‟s theorem on primitive elements ,Normal extentions, Roots of unity.

Unit-III

Galois extensions, The Fundamental theorem of Galois theory, Cyclotomic extentions, Abelian extensions, cyclic extensions, Frobenius mapping, Galois groups of finite fields, Quintic equations and solvability by radicals, Constructive polygons.

BOOKS PRESCRIBED:

1. Fraleigh, J.B. A first course in Abstract Algebra, Narosa Publishing House, New Delhi.
2. Dummit, D.S. and Foote, R.M.Abstract Algebra, John-Wiely and Sons, Students Edition-1999.
3. Bhattacharya, P.B.,Jain,S.K. and Nagpal, S.R.Basic Abstract Algebra, Cambridge University Press, 1997.
4. Singh,S. and Zameeruddin,Q.Modern Algebra, Vikas Publishing House,New Delhi.
5. Hungerford, T.W.Algebra,Springer 1974.
6. Bastida, J.R.Field Extensions and Galois Theory, Encyclopedia of Mathematics and its Applications, Volume 22, Addison – Wesley Publishing company.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Deal with the problems based on finite and infinite fields.
CO2	Detect the simple field, splitting field, perfect field etc.
CO3	Have an idea of splitting field of a given.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-IV)

COURSE CODE: Paper-MHM- 404

COURSE TITLE: OPERATIONS RESEARCH-II

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 60 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: ENGLISH **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week

COURSE OBJECTIVES:

- In this course basic concepts of Queuing theory and its generalized models are introduced.
- The course explains inventory control and inventory models for specific situations in an organization.
- The course is designed to introduce characteristics of single server/multi servers queuing models with limited and unlimited capacity.
- The course is designed to give detailed description of replacement problems, mortality theorems and simulation models.

COURSE CONTENT:

Unit-I

Queueing Theory: Introduction, Queueing System, elements of queueing system, distributions of arrivals, inter arrivals, departure service times and waiting times. Classification of queueing models, Queueing Models**:** (M/M/1) :(∞/FIFO), (M/M/1) :(N/FIFO), Generalized Model: Birth-Death Process, (M/M/C) :(∞/FIFO), (M/M/C) :(N/FIFO).

Unit-II

Inventory Control: The inventory decisions, costs associated with inventories, factors affecting Inventory control, Significance of Inventory control, economic order quantity (EOQ), Deterministic inventory problems without shortage and with shortages, EOQ problems with price breaks, Multi item deterministic problems.

Unit-III

Replacement Problems: Replacement of equipment/Asset that deteriorates gradually,

replacement of equipment that fails suddenly, Mortality Theorem, recruitment and promotion problem, equipment renewal problem. Simulation: Need of simulation, methodology of simulation. Simulation models, event- type simulation, generation of random numbers, Monte Carlo simulation. Simulation of inventory problems, queueing system, Maintenance problems and job sequencing.

BOOKS PRESCRIBED:

1. R.Panneerselvam: Operations Research
2. Taha, H.A.: Operations Research
3. Chaddrasekhara, Rao & Shanti Lata Mishra: Operations Research
4. Kanti Swarup, Gupta, P.K. & Man Mohan: Operations Research
5. Mustafi, C.K.: Operations Research Methods & Practice.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Study the Operations Research for the purpose of making better decisions.
CO2	learn about management and administration of socio-cultural behavior and economic factors that exist as bottleneck to effective implementation.
CO3	analyze complex real life problems typically with the goal of improving or optimizing performance .
CO4	develop more effective approaches to programming by using different queuing models,generalizedmodels,power supply model etc., customer's preference relating to the size,colour packaging .
CO5	determine the size of the stock to meet the future demand by applying inventory control methods,replacement problems

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.-Mathematics (Semester-IV)

COURSE CODE: Paper-MHM- 405

COURSE TITLE: DISCRETE MATHEMATICS-II

CREDIT HOURS (PER WEEK): 6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
(THEORY: 75
INTERNAL ASSESSMENT: 25)

TIME: 3Hours
MEDIUM: ENGLISH

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B from unit I, section C from unit II and section D from unit III.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D will consist of six questions and students are required to attempt a total of ten questions selecting at least three questions from each section. Each question will carry seven marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To gain knowledge about computing and mathematics appropriate to the discipline
- To learn sets and its operations and represent using Venn diagram
- To represent the problem using propositional logic and convert it as gates and truth table
- To visualize the given problem as graphs and tree representation
- To apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices

COURSE CONTENT:

Unit-I

Graph Theory**:** Tree, Rooted tree, search, spanning trees, minimal spanning trees, Kruskal's algorithm. Chromatic number, four-colour problem, chromatic polynomials.

Unit-II

Recurrence relation and Generating functions: Order and degree of recurrence relation, telescoping form, solution of linear recurrence relation, homogeneous solution, closed form expression, generating function, solution of recurrence relations using generating functions.

Unit-III

Combinatorics: Principle of mathematical induction**,** The basic of counting**,** Inclusion and

exclusion principle, Pegionhole principle.

BOOKS PRESCRIBED:

1. Trambley, J.P. and Manohar,R: Discrete Mathematical Structures with Applications to Computer Science.
2. Liu C.L.: Elements of Discrete Mathematics.
3. Alan Doerr and Kenneth Levasseur: Applied Discrete Structures for Computer Science
4. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Sciences

COURSE OUTCOME:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Learn about Graph theory, the mathematics of network is one of the most important branches of discrete mathematics which is most useful for traveling salesman problems etc.
CO2	learn to apply the trees and graphs in finding the travelling routes.
CO3	Solve practical problems using inclusion-exclusion principle and Pigeon hole principle.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.-Mathematics
(Semester-IV)
COURSE CODE: Paper- MHM-406
COURSE TITLE: Programming in C

CREDIT HOURS (PER WEEK): T4+P2.6
TOTAL HOURS: 60 Hrs
MAXIMUM MARKS: 100
(THEORY: 56
INTERNAL ASSESSMENT THEORY: 19
PRACTICAL MARKS: 18
PRACTICAL INTERNAL ASSESSMENT MARKS: 07)

TIME: 3 Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTER:
Note: The question paper covering the entire course shall be divided into three sections.

Section A: It will have question No.1 consisting of 10 very short answer questions from the entire syllabus. Students will attempt 6 questions. Each question will carry two marks with answer to each question up to 10 lines in length. The total weightage being **12 marks**.

Section B: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 2, 3, 4 and 5 will be set by the examiner from Unit-I of the syllabus. The students will be required to attempt any two questions. Each question will carry 11 marks.
The total weightage of this section shall be **22 marks.**

Section C: It will consist of essay type/numerical questions up to five pages in length. Four questions numbering 6, 7, 8 and 9 will be set by the examiner from Unit-II of the syllabus. The students will be required to attempt any two questions. Each question will carry 11 marks.
The total weightage of this section shall be **22 marks**.

COURSE OBJECTIVES:

- The course is designed to provide complete knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- Also, by learning the basic programming constructs they can easily switch over to any other language in future.

COURSE CONTENT:

UNIT-I

Logic Development Tools: Data Representation, Flow Charts, Problem Analysis, Decision Trees/Tables, Pseudo Codes and Algorithms
Fundamentals: Character Set, Identifiers and Key Words, Data Types, Constants,

Variables, Expressions, Statements, Symbolic Constants.
Operators and Expressions: Arithmetic Operators, Unary Operators, Relational and logic Operators, Assignment and Conditional Operators, Library functions.
Data Input and Output: Preliminaries, getch , getche , getchar , gets, puts, scanf, printf functions.

Control Statements: Preliminaries, If statement, If–else statement, nested-if statement, else-if ladder statement, While, Do–While and For statements, Nested loops, Switch, Break, Continue statements.
Functions: Brief overview, defining, accessing function, passing arguments to a function, specifying argument data types, function prototypes, recursion.

UNIT-II

Arrays: Defining and processing an array, passing array to a function, multi – dimensional arrays.
Strings: String declaration, string functions and string manipulation.
Pointers: Fundamentals, pointer declaration, operations on pointers, pointer and one dimension arrays ,passing pointers to a functions, pointers & multi–dimensional arrays

Storage classes: Automatic, external and static variables.
Structures & Unions: Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, self-referential structure, unions.
Data Files: Opening, closing, creating and processing of data files.

BOOKS PRESCRIBED:

1. Programming in C : Schaum Outlines Series.
2. C Programming : Stephen G. Kochan.
3. Let Us C : Yashwant Kanitka
4. C: The complete reference by Herbert Schildt.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Use the fundamentals of C programming in trivial problem solving
CO2	Identify solution to a problem and apply control structures and user defined functions for solving the problem
CO3	Demonstrate the use of Strings and string handling functions
CO4	Ability to work with arrays of complex objects.
CO5	Apply skill of identifying appropriate programming constructs for problem solving.

.

Academic Session 2021-22

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

PROGRAMME CODE: MMAH

The M.Sc. Mathematics Degree programme lays equal emphasis on motivating and training students towards higher education in the discipline and employability. With the focus on imparting quality education, the students are exposed to pure, applied and applicable Mathematics. Intercollegiate competitions are organised and interclass competitions in Mathematics taps the potentials of the students. Participation are offered to students to widen the horizon of knowledge with a focus on research.

ELIGIBILITY:

- B.Sc. (Hons.) Mathematics with atleast 50% of marks.

PROGRAMME OBJECTIVES:

- To enhance problem solving skills and develop logical thinking.
- To exhibit proficiency in application of mathematics to solve daily life problems.

PROGRAMME SPECIFIC OUTCOMES:

- Understand the nature of abstract mathematics and explore the concepts in various fields.
- Comprehend and write effective reports and design documentation related to mathematical research and literature, make effective presentations.
- To make them expertise in using ICT tools in solving problems in mathematics.
- Inculcate mathematical reasoning and assimilate complex mathematical ideas and arguments.
- Communicate mathematical ideas with clarity and coherence, both written and verbally.

Academic Session 2021-22

Scheme for M.Sc. Mathematics (under the Hons. Scheme)

Semester-I

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHMH-101	Real Analysis-I	75	25	100	75
2.	MHMH-102	Modern Algebra	75	25	100	75
3.	MHMH-103	Applied Linear Algebra	75	25	100	75
4.	MHMH-104	Number Theory	75	25	100	75
5.	MHMH-105	Complex Analysis	75	25	100	75
6.	MHMH-106	Differential Equations	75	25	100	75
Total			450	150	600	450

Semester-II

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHMH-201	Real Analysis-II	75	25	100	75
2.	MHMH-202	Advanced Algebra	75	25	100	75
3.	MHMH-203	Probability Theory	75	25	100	75
4.	MHMH-204	Classical Mechanics and Calculus of variation	75	25	100	75
5.	MHMH-205	Differential Geometry	75	25	100	75
6.	MHMH-206	Mathematical Methods	75	25	100	75
Total			450	150	600	450

Chairperson, BoS in Mathematics

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-I)

COURSE CODE: Paper-MHMH- 101

COURSE TITLE: REAL ANALYSIS –I

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 60 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of 5 questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- This course introduce students to the fundamentals of mathematical analysis .
- The objective of this course is to enable students to understand the concept of cardinality of a set,open sets, closed sets, compact sets and connected sets.
- Students wil realize how these notions are generalized from real line to metric spaces.

COURSE CONTENT:

Unit-I

Countable and uncountable sets. Metric spaces**:** Definition and examples, open sets, closed sets, Compact sets, elementary properties of compact sets.

Unit-II

Compactness of k- cells, Compact subsets of Euclidean space R^k. Heine-Borel theorem, Perfect sets,
The Cantor set, Separated sets, connected sets in a metric space, connected subsets of real line.

Unit-III

Functions of Bounded Variation, Sequences in Metric Spaces**:** Convergent sequences (in Metric Spaces), subsequences, Cauchy Sequences, Complete metric spaces, Cantor's Intersection Theorem, Baire's theorem, Banach contraction principle.

Unit-IV

Continuity**:** Limits of functions (in metric spaces) Continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotonic functions, Uniform Continuity.

BOOKS PRESCRIBED:

1. Walter Rudin: Principles of Mathematical Analysis (3rd Edition) McGraw- Hill td., Ch.2, Ch.3.
2. Simmons, G.F.: Introduction to Topology and Modern Analysis, McGraw-Hill Ltd. (App.1)
3. Shanti Narayan and P.K. Mittal : A Course of Mathematical Analysis.
4. S.C. Malik & Savita Arora: Mathematical Analysis, Wiley Eastern Ltd.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Introduce students to the fundamentals of mathematical analysis and reading and writing mathematical proofs.
CO2	Correlate Calculus with real analysis by finding infinite sums and evaluating limits to understanding the concept of continuity and uniform continuity one is doing real analysis.
CO3	Understand the concept of cardinality of a set, open sets, closed sets, compact sets and connected sets, complete spaces, continuity and uniform continuity in a metric space.
CO4	Realizes how these notions are generalized from real line to metric spaces.

Academic Session 2021-22

Khalsa College Amritsar
(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-I)

COURSE CODE: Paper-MHMH- 102

COURSE TITLE: MODERN ALGEBRA

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM: English **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of 5 questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To understand Rings, Ring homomorphisms, Direct product of the rings and Euclidean Rings.
- To study the Composition series, Groups of automorphisms, Symmetric groups and Alternating groups.

COURSE CONTENT:

Unit-I

Composition series, the Jordan Holder theorem, Groups of automorphisms, Inner automorphisms, Symmetric groups, Alternating groups, Sylow's theorems, p-groups.

Unit-II

Nilpotent groups, Simplicity of A_n ;$n \geq 5$, Cayley's theorem, the imbedding theorem, Commutator subgroup, Characteristic Subgroup, Solvable groups, Sequences of subgroups.

Unit-III

Direct product and semi direct product of groups, Fundamental theorem of finitely generated abelian groups, Free groups, groups of symmetries, Groups of small order.

Unit IV

Rings, Subrings, Ideals, Factor rings, Homomorpghisms, Integral domains, Maximal and prime

ideals. The field of quotients of an integral domain, Chinese remainder theorem, simple rings, Ideals of matrix rings.

BOOKS PRESCRIBED:

1.Artin,. M : Algebra, Prentice-Hall, 1991
2. I.N. Herstein,: Topics in Algebra, 2nd edition, Wiley I
3.Dummit, D.S.: Abstract-Algebra, John-Wiley & Sons, Students Edition-1999 & Foote
4.Fraleigh, J. B.: An Introduction to Abstract Algebra.
5. J Gallian : Contemporary Abstract Algebra, CENGAGE.
6.Surjit Singh & Quazi zamerrudin. Modern Algebra, Vikas Pub. House.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	recognize the foundation required for more advanced studies in Algebra.
CO2	use group theory in modern physics which is based on symmetry principles.
CO3	apply group theory such that the existence of several particles can be predicted before they are experimentally observed.
CO4	apply group theory in chemistry such as the symmetry of a molecule provides students with the information of energy levels of the orbital , the orbital symmetries,bond order.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: **M.Sc.Mathematics (under the Hons. Scheme)**

(Semester-I)

COURSE CODE: Paper-MHMH- 103

COURSE TITLE: APPLIED LINEAR ALGEBRA

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

Time: 3Hours **MAXIUMMARKS: 100**

MEDIUM: English **(THEORY: 75**

INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1.Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2.The Section–A will consist of five compulsory questions each of one mark.
3.Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4.Question paper should cover at least 40% article work from the recommended books.
5.Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course will introduce the basic concepts of dual spaces and its general proofs.
- The course is designed to introduce the relationship of matrices and linear transformations and different classes of linear operators on inner product spaces and their structures.

- The course gives introduction of inner product spaces, orthogonal vectors, orthogonal sets and Gram Schmidt orthogonalization process.
- The course explains the concepts of bilinear and quadratic forms on vector spaces.

COURSE CONTENT:

Unit-I

Linear Functionals, Dual spaces and Dual basis, The double dual, Subspaces invariant under linear operators, Characteristic and minimal polynomials, Eigen values and Eigen Vectors of Linear Operators.

Unit-II

Triangulation, Diagonalization, Jordan canonical form, Generalized eigen vectors, canonical basis, rational canonical form.

Unit-III

Bilinear forms, Self-Adjoint Operators, Sylvester's theorem, quadratic forms, Hermitian forms.

Unit-IV

Inner Product Spaces, The Gram-Schmidt Orthogonalization, orthogonal complements. The Adjoint of a Linear operator on an inner product space, Normal and Unitary Operators, Spectral Theorem.

BOOKS PRESCRIBED :

1.Hoffman, K. and Kunze, R.: Linear Algebra, Second Edition, Prentice Hall,1971
2.Axler, S.: Linear Algebra Done Right, Second Edition, Springer- Verlag,1997
3.Friedberg, S.H.Insel,A.J, Spence, L.E. : Linear Algebra, Fourth Edition Prentice Hall, 2003
4.Lang, S.: Linear Algebra, Third edition Springer-Verlag, 1987.
5.Sahai, Vivek and Bist, Vikas: Linear Algebra, Narosa Publishing House, 2008

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	deepen their understanding of Linear Algebra.
CO2	become familiar with the concepts of linear independence, basis, span, linear maps, the properties of linear transformations and orthogonal decomposition of inner product spaces.

CO3	have a good knowledge of inner product spaces, and will be able to define and use the adjoint of a linear map on a finite-dimensional inner product space.
CO4	construct the matrix of a bilinear form and to find index, rank and signature of a bilinear form.
CO5	determine a linear operator is normal, unitary and orthogonal projection and to construct the spectral decomposition of normal and self-adjoint operators.

Academic Session 2021-22

(Semester-I)
COURSE CODE: Paper-MHMH- 104
COURSE TITLE: NUMBER THEORY

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**
MEDIUM: English **(THEORY: 75**
INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To provide an introductory course in Number Theory.
- To introduce the fast growing and relevant topic of Cryptography as an application of Number Theory.

COURSE CONTENT:

Unit-1

The sum of non negative divisors of an integer, Number of divisors of an integer, Multiplicative functions,Greatest Integer function, Mobius function,The Mobius Inversion formula, Euler's Phi- function and its properties.

Unit-II

Euler's theorem**,** The order of an integer modulo n, Primitive roots for primes, Composite Numbers having primitive roots, theory of indices and its application to solving congruences.

Unit-III

Quadratic residue modulo a prime, Euler's criterion, The Legendre symbol and its properties, Gauss Lemma, Quadratic reciprocity law, Jacobis symbol and its Properties, Pythagorean triplets, Insolvability of Diophantine equation $x^4 + y^4 = z^4$, $x^4 - y^4 = z^2$ in positive integers.

Unit-IV

Representation of an integer as a sum of two squares and sum of four squares, finite and infinite simple continued fractions, Convergence of a continued fraction and their properties, Pell's equations.

BOOKS PRESCRIBED:

1.David M. Burton: Elementary Number Theory, Mc Graw Hill 2002.

2.G.H.Hardy and E.M.Wright : An Introduction to the Theory.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Form the bridge between pure mathematics and applied mathematics.
CO2	Apply Number Theory in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
CO3	understand the various types of numbers and their properties.
CO4	use various arithmetic functions and the concept of congruences to solve various arithmetic problems.
CO5	Analyze the study of integers and integer-valued functions.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-I)

COURSE CODE: Paper-MHMH- 105

COURSE TITLE: COMPLEX ANALYSIS

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**

MEDIUM: English **(THEORY: 75**

INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of four sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- It is useful in many branches of mathematics, including algebraic geometry, number theory, analytic combinatorics; as well as in physics, including the branches of hydrodynamics, thermodynamics, and particularly quantum mechanics.
- By extension, use of complex analysis also has applications in engineering fields such as nuclear, aerospace, mechanical and electrical engineering.
- The content of this course is designed to make the students understand the properties of analytic functions, concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

COURSE CONTENT:

Unit-I

Functions of complex variables, limit, continuity and differentiability, Analytic functions,

Conjugate function, Harmonic function. Cauchy Riemann equations (Cartesian and Polar form). Construction of analytic functions.

Unit-II

Complex line integral, Cauchy's theorem, Cauchy's integral formula and its generalized form. Cauchy's inequality. Poisson's integral formula, Morera's theorem. Liouville's theorem.
Power
Series and it's circle of convergence.

Unit-III

Taylor's theorem, Laurent's theorem, Zeros & Singularities of an analytic function, Residue at a pole and at infinity, Cauchy's Residue theorem, Integration round Unit circle. Evaluation of integrals of the form $\int_{-\infty}^{\infty} f(x)dx$

Unit-IV

Jordan's lemma, Fundamental theorem of algebra, argument principle, Rouche's theorem, conformal transformation, Bilinear transformation, critical points, fixed points, cross ratio, problems on cross ratio and bilinear transformations

BOOKS PRESCRIBED:

1. Copson, E.T .:Theory of functions of complex variables.
2. Ahlfors, D. V.:Complex analysis.
3. Titchmarsh, E.C.:Theory of functions of a complex variable.
4. Conway, J.B.:Functions of one complex variable

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	understand the properties of analytic functions.
CO2	to understand the concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-I)

COURSE CODE: Paper-MHMH- 106

COURSE TITLE: DIFFERENTIAL EQUATIONS

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM: English **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Studemts will be able to know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
- Students will understand properties of solutions of differential equations is fundamental to much of contemporary science and engineering.
- Ordinary differential equations (ODE's) will help the students to deal with functions of one variable, which can often be thought of as time.

COURSE CONTENT:

Unit-I

Existence and uniqueness theorem for solution of the equation $dx/dy = f(x,y)$, the method of successive approximation, general properties of solution of linear differential equation of order n, adjoint and self-adjoint equations. Total differential equations. Simultaneous differential equations.

Unit-II

Sturm Liouville's boundary value problems. Sturm comparison and Separation theorems. First order PDE's., Integral surface through a given curve. Surface orthogonal to given system of surfaces.

Unit-III

Non linear PDE's of first order. Charpit's method and Jacobi's method, PDE's of the 2^{nd} order. Linear PDE's with constant coefficients. Second order PDE's with variable coefficients and their classification.

Unit-IV

Non-linear PDE's of second order, Monge's Method. Solution of linear hyperbolic equation, Solution of Laplace, wave and diffusion equations by method of separation of variables.

BOOKS PRESCRIBED:

1. Piaggio, H.T.H.: Differential equations.
2. Ross, S.L.: Differential equations.
3. Sneddon, I. N. : Elements of partial differential equations.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	learn to express laws of nature with the help of differential equations.
CO2	know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
CO3	focus on the equations and techniques most useful in science and engineering.
CO4	Understand properties of solutions of differential equations which is fundamental to much of contemporary science and engineering.
CO5	learn to formulate, classify and transform first order partial differential equation into canonical forms.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE: Paper-MHMH- 201

COURSE TITLE: **REAL ANALYSIS –II**

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

TIME: 3Hours **MAXIMUM MARKS: 100**

MEDIUM: **English** **(THEORY: 75**

INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course objective is to enable students to understand Riemann Stieltjes integrability of a bounded function.
- Students will recognize the difference between pointwise and uniform convergence of sequence and series of functions.
- Students will be familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
- Students will analysis the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.

COURSE CONTENT:

Unit I

The Riemann Stieltje's Integral: Definition and existence of Riemann Stieltje's integral, Properties of integral. Integration and Differentiation. Fundamental Theorem of Calculus, Ist and 2^{nd} Mean Value Theorems of Riemann Stieltje's integral.

Unit II

Integration of vector valued functions, Sequence and Series of functions: Uniform

Convergence, Uniform Convergence and continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation.

Unit III

.Equicontinuous families of functions, Arzela's Theorem, Weierstrass Approximation theorem. The Stone-Weierstrass theorem.

Unit IV

Power series : Radius of convergence, properties, Abel's Theorem, Taylor's Theorem

Fourier series :Convergence, Riemann Lebesgue Lemma, Bessel's inequality, Parseval's Equality.

BOOK PRESCRIBED:

1.Walter Rudin: Principles of Mathematical Analysis (3rd edition) Mc Graw Hill Ltd.Ch.6,Ch.7,Ch.8, Ch.9(9.1-9.8).

2.S.C.Malik & Savita Arora: Mathematical Analysis, Wiley Eastern Ltd.

3. Shanti Narayan & P.K. Mittal : A Course of Mathematical Analysis, S.Chand & Co.

4. Apostol, T.M. : Mathematical Analysis 2nd Edition Theorem (7.18, 7.30 & 7.31)

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	studies the behavior of sequences and series of functions.
CO2	familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
CO3	Analyzes the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.
CO4	understand Riemann Stieltjesintegrability of a bounded function and prove a selection of theorems concerning integration.
CO5	recognize the difference between pointwise and uniform convergence of sequence and series of functions, Equicontinuous families of functions, Arzela Ascoli's theorem and Weierstrass Approximation Theorem .

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE: **Paper-MHMH- 202**

COURSE TITLE: ADVANCED ALGEBRA

CREDIT HOURS (PER WEEK):6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM -ENGLISH **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- To understand Principal Ideal domains, Euclidean Rings and Unique factorization domains.
- To study the Modules and Structure theorem of modules over PID's.
- To study the Torsion module, Torsion free modules, Nakayama lemma, Artinian and Noetherian modules.

COURSE CONTENT:

Unit-I

Principal Ideal domains, Euclidean Rings. The ring of Gaussian Integers, Unique factorization domains, Gauss lemma, Polynomial rings, Division algorithm, factorization in polynomial rings over unique factorization domains.

Unit-II

Modules, Submodules, free modules, quotient modules, Homomorphism theorems, Direct sums, Finitely generated modules, Simple modules, Cyclic modules, Differences between modules over rings and vector spaces.

Unit-III

Modules over PID's, Structure theorem of modules over PID's. Torsion module, Torsion free modules, Artinian and Noetherian modules, Artinian and Noetherian rings, module of finite length.

Unit-IV

Prime ideals and maximal ideals in commutative rings, Nil radical, Jacobson radical, Operations on ideals, Extension and contraction of ideals, Nakayama lemma, Exact sequences

of modules.

BOOKS PRESCRIBED:

1. Fraleigh, J. B.: A first course in Abstract Algebra 7th edition, Narosa Publishing House, New Delhi.
2. Singh ,S. and Zameeruddin ,Q.: Modern Algebra, Vikas Publishing House, New Delhi.
3. Dummit, D.S. & Foote, R.M. : Abstract-Algebra, John-Wiley & Sons, Students Edition-1999
4. Bhattacharya, P.B.,Jain, S.K., Nagpal, S.R. : Basic Abstract Algebra, Cambridge University Press, 1997.
5. Musili, C.: Rings and Modules, Narosa Publishing House, New Delhi, 1994.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Use ring theory in wide areas of current research in mathematics, computer science and mathematical/theoretical physics.
CO2	introduce themselves with the concepts and develop working knowledge on simple ring and ring homomorphism.
CO3	know the structure of rings, their representations, modules, special classes of rings (group rings, division rings, and universal enveloping algebras).
CO4	Deal with developments of commutative ring theory, which is a major area of modern mathematics.
CO5	appreciate the significance of unique factorization in rings and integral domains.

.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)
(Semester-II)
COURSE CODE: Paper-MHMH- 203
COURSE TITLE: PROBABILITY THEORY

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM -ENGLISH INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS:

1.Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III, IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.
6. Use of Non-programmable Scientific calculator is allowed.

COURSE OBJECTIVES:

- The main objective of this course is to provide students with the foundation of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction networks etc.
- With this course learner will have good understanding of exploratory data analysis.
- Students will learn the differences between discrete distributions and continuous distribution.

COURSE CONTENT:

Unit-I

Classical and axiomatic approach to the theory of probability, additive and multiplicative law of probability, conditional probability and Baye's theorem. Random variable, probability mass function, probability density function, cumulative distribution function, distributions of functions of random variable.

Unit-II

Two and higher dimensional random variables and their functions, joint distribution, marginal and conditional distributions, Bivariate and multivariate transformation of random variable, Stochastic independence. Mathematical expectations, moments, moment

generating function, Characteristic function, Chebyshev's and Cauchy Schwartz Inequality.

Unit-III

Discrete Distributions: Uniform, Binomial, Poisson, Geometric, Hyper geometric, Multinomial. Continuous Distributions: Uniform, Exponential, Normal distributions, Gamma distribution, Beta distribution.

Unit-IV

Chi-square distribution, t-distribution, F distribution, sampling distribution of mean and variance of sample from normal distribution. Convergence in probability and convergence in distribution, central limit theorem (Laplace theorem Linderberg, Levy's Theorem). probability generating function.

BOOKS PRESCRIBED:

1. Hogg, R.V., Mckean, J.W. and Craig, A.T. : Introduction to Mathematical Statistics.
2. Rohtagi; V.K. and Ehsanes: Introduction to Probability and Statistics.
3. Casella, G. and Berger, R. L.: Statistical Inference.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	acquaint with the foundation of probabilistic and statistical analysis ,mostly used in engineering and science like disease modeling, climate prediction networks etc.
CO2	take informed decisions about a population by examining only a small random sample of the members of that population.
CO3	quantify the uncertainty and assess the accuracy of our inference about the population.
CO4	have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set.
CO5	become informed consumer of statistical information provided in newspaper, magazine and journals.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)
(Semester-II)
COURSE CODE: Paper-MHMH- 204
COURSE TITLE: CLASSICAL MECHANICS AND CALCULUS OF VARIATIONS

COURSE CREDIT (PER WEEK): 6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours **(THEORY: 75**
MEDIUM: ENGLISH **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The course will introduce the concepts of Lagrange's equation for holomonic and non holomonic constraints.
- The course is designed to introduce the applications of Lagrange's formulation and generalized coordinates.
- The course gives introduction of fundamental problems of calculus of variations and variational problems with moving boundaries.
- The course explains the concepts of variation of a functional and its properties.

COURSE CONTENT:

Unit-I

Generalized co-ordinates and generalized velocities, virtual work, generalized forces, Lagrange's equations for a holonomic dynamical system, conservative system, holonomic dynamical system for impulsive forces and their applications.

Unit-II

Kinetic energy as a quadratic function of velocities, theory of small oscillations, Functional, variation of functional and its properties, fundamental lemma of calculus of variation, Euler's equations, necessary and sufficient conditions for extremum, The Brachistochrone problem, Functionals dependent on higher order derivatives and several dependent variables.

Academic Session 2021-22

Unit-III

Variational problems with fixed boundaries, Transversality conditions, Orthogonality conditions, Sturm-Liouville's theorem on extremals, one sided variations, Hamilton's principle, The principle of least action, Langrange's equations from Hamilton's principle.

Unit-IV

Variational Methods: Direct Methods, Euler's finite difference method, The Ritz method, Kantorovich Method for Boundary value problems in ODE's & PDE's, Isoperimetric Problems.

BOOKS PRESCRIBED:

1. Chorlton, F.: Text Book of Dynamics.
2. Elsgolts, L: Differential Equations and the Calculus of Variations.
3. Gelfand,I.M. and Fomin, S.V.: Calculus of Variations.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	apply the classical mechanics approach to solve a mechanical problems
CO2	understand the concept of functional and determine stationary paths of a functional to deduce the differential equation for stationary paths.
CO3	describe and understand the motion of a mechanical system using Lagrange Hamilton formalism.
CO4	recognize the degrees of freedom and understand the concept of generalized coordinates.
CO5	apply the concepts of classical mechanics in Geology, engineering, and many other inter-disciplinary areas.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc.Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE: Paper-MHMH- 205

COURSE TITLE: DIFFERENTIAL GEOMETRY

CREDIT HOURS (PER WEEK): 6

TOTAL HOURS: 75 hrs

MAXIMUM MARKS: 100

TIME: 3Hours **(THEORY: 75**

MEDIUM: English **INTERNAL ASSESSMENT: 25)**

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A, which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2.The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- Differential geometry is a mathematical discipline that uses the techniques of calculus to study the problems in geometry.
- Differential geometry have many applications in different fields. In computer vision (used to analyze shapes), in engineering (to solve problems in digital signal processing), in economics (to the field of econometrics) and in chemistry and biophysics (in modeling cell membrane structure under varying pressure).
- The aim of this course is to get the students familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals, the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

COURSE CONTENT:

Unit – I

Curves in R^3 **:** A simple arc, curves and their parametric representation, arc length, Contact of curves, tangent line, principal normal, binormal, osculating plane, normal plane, rectifying plane.

Unit – II

Curvature and torsion, Serret-Frenet Formule, Helics, Evolute and Involute of a parametric curve,

spherical curves. osculating circles and spheres.

Unit-III

Einstein's summation convention, Transformation of coordinates, tensors law for transformation, contra variant, covariant and mixed tensors, Addition, outer product, contraction, inner product and quotient law of tensors, metric tensor and Riemannian metric, Christoffel symbols, Covariants, differentiation of tensors.

Unit-IV

Surfaces in R^3**:** Implicit and Explicit forms for the equation of the surface, the two fundamental forms of a surface, Family of surfaces, Edge of regression, Envelops, Ruled surface, Developable and skew surfaces, Gauss and Weingarten formulae.

BOOKS PRESCRIBED:

1. A. Pressley: Elementary Differential Geometry, Springer, 2005.
2. T.J.Willmore: Introduction to Differential Geometry
3. Martin M. Lipschutz: Differential Geometry
4. U.C. De; A.A. Shaikh & J. Sengupta: Tensor Calculus
5. M.R. Spiegel: Vector Analysis
6. D. Somasundaram: Differential Geometry – A First course, Narosa Publishing House

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals.
CO2	know the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE: Paper-MHMH- 206

COURSE TITLE: MATHEMATICAL METHODS

CREDIT HOURS (PER WEEK):6
TOTAL HOURS: 75 hrs
MAXIMUM MARKS: 100
TIME: 3Hours (THEORY: 75
MEDIUM: English INTERNAL ASSESSMENT: 25)

INSTRUCTIONS FOR PAPER SETTERS

1. Question paper will consist of five sections namely section A which will be from entire syllabus (equally distributed from each unit), section B, C, D & E from unit I, II, III & IV respectively.
2. The Section–A will consist of five compulsory questions each of one mark.
3. Each section B, C, D & E will consist of two questions and students are required to attempt a total of five questions by selecting at least one question from each section. Each question will carry fourteen marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper will be eight periods per week.

COURSE OBJECTIVES:

- The objective of this course is to provide students an understanding of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
- The concept of Volterra and Fredholm integral equations and solutions of these equations using various methods.

COURSE CONTENT:

Unit-I

Laplace Transform: Definition, existence and basic properties of the Laplace transform, Inverse Laplace transform, Convolution theorem, Laplace transform solution of linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit-II

Fourier Transform: Definition, existence, and basic properties, Convolution theorem, Fourier transform of derivatives and Integrals, Fourier sine and cosine transform, Inverse Fourier transform, solution of linear ordinary differential equations and partial differential equations.

Unit-III

Volterra Equations: Integral equations and algebraic system of linear equations. Volterra equation, L_2 –kernels and functions. Volterra equations of first & second kind. Volterra integral equations and

linear differential equations.

Unit-IV

Fredholm equations, solutions by the method of successive approximations. Neumann's series, Fredholm's equations with Pincherte-Goursat Kernels.

BOOKS PRESCRIBED:

1. Tricomi, F.G. : Integral Equation (Ch. I and II)
2. Kanwal R, P : Linear Integralequations
3. S.G. Mikhlin : Integral equations
4. Pinckus, A. and Zafrany, S.: Fourier Series and Integral Transforms

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	prepare themselves with mathematical tools and techniques that are required in advanced courses offered in the applied mathematics and engineering problems.
CO2	apply concept of mathematical methods in diverse areas of science and technology such as electric analysis, communication engineering,solution of partial differential operation.
CO3	learn to solve the Integral equations which are encountered in various problems including radiative transfer, and the oscillation of a string, membrane, or axle.
CO4	Understand the concept of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
CO5	interpret the concept of Volterra and Fredholm integral equations and find solutions of these equations using various methods.

Academic Session 2021-22

Scheme of course B.A./B.Sc.

(Subject Mathematics)

Semester-I

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-101	Algebra	38	12	50	60
2.	M-102	Calculus and Trigonometry	37	13	50	60

Semester-II

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-201	Calculus and Differential equations	38	12	50	60
2.	M-202	Calculus	37	13	50	60

Semester-III

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-301	Analysis	38	12	50	60
2.	M-302	Analytical Geometry	37	13	50	60

Semester-IV

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.

Academic Session 2021-22

1.	M-401	Statics and Vector Calculus	38	12	50	60
2.	M-402	Solid Geometry	37	13	50	60

Chairperson, BoS in Mathematics

Academic Session 2021-22

Semester-V

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-501	Dynamics	38	12	50	60
2.	M-502	Number Theory	37	13	50	60

Semester-VI

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-601	Linear Algebra	38	12	50	60
2.	M-602	Numerical Analysis	37	13	50	60

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–I

MATHEMATICS

COURSE CODE: M-101

COURSE TITLE: PAPER–I: ALGEBRA

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS: 60 hrs
MAXIMUN MARKS: 50
(THEORY: 38
INTERNAL ASSESSMENT: 12)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV respectively.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B, C, D& E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Algebra is a very unique discipline which is very abstract.
- The abstractness of Algebra causes the brain to think in totally new pattern.
- Algebra helps in expression of abstract ideas and easily students can learn matrix algebra, vector spaces, eigen values and eigen vectors, Cardon's and Descarte's methods of solving a system of equations and inequalities.
- Algebra describes the fundamental properties of real numbers that lead to the formal development of Real Analysis.

COURSE CONTENT:

Unit-I

Linear independence of row and column vectors. Row rank, Column rank of a matrix, Equivalence of column and row ranks, Nullity of a matrix, Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit-II

Eigen values, Eigen vectors, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field.

Unit-III

Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Matrix Congruence of skew–symmetric matrices. Reduction in the real field. Classification of real quadratic forms in variables. Definite, semi–definite and indefinite real quadratic forms. Characteristic properties of definite, semi–definite and indefinite forms.

Unit-IV

Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations and symmetric function of roots, Descarte's rule of signs, Newton's Method of divisors, Solution of cubic equations by Cardan method, Solution of biquadratic equations by Descarte's and Ferrari's Methods.

BOOKS PRESCRIBED:

1. K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002).
2. H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.
3. Chandrika Parsad: Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Solve problems based on matrices, vector spaces, eigen values and eigen vectors,
CO2	Recognize consistency and inconsistency of linear equations.
CO3	Understand the relation between roots and coefficients.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–I

MATHEMATICS

COURSE CODE: M-102

COURSE TITLE: PAPER–II: CALCULUS AND TRIGONOMETRY

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 37
INTERNAL ASSESSMENT: 13)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV respectively.
2. The Section–A will consist of seven compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Calculus has widespread applications in science, economics, and engineering and can solve many problems for which algebra alone is insufficient.
- Trigonometry is a branch of mathematics that studies relationships between side lengths and angles of triangles.
- Students will apply calculus and Trigonometry in areas such as geodesy, surveying, celestial mechanics, and navigation.
- Students will learn relationships to other branches of mathematics, in particular complex numbers, infinite series, logarithms and calculus.

COURSE CONTENT:

Unit-I

Real number system and its properties, lub, glb of sets of real numbers, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuity.

Unit-II

Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms.

Unit-III

De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses.

Unit-IV

Exponential and Logarithmic function of complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

BOOKS PRESCRIBED:

1. N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.
2. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
3. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.
4. Shanti Narayan and P.K. Mittal: Differential Calculus, S Chand & Company.
5. Shanti Narayan and P.K. Mittal: Real Analysis, S Chand & Company.
6.Rajinder Pal Kaur:Calculus, First world Publication, Ludhiana.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get acquainted with the limits, functions, derivatives, integrals, and infinite series.
CO2	Associate Differential equations with the Mathematical modeling.
CO3	Solve multifarious differential equation that relates functions with its derivatives.
CO4	Know about concavity and convexity of the functions, Asymptotes and multiple points of a curve.
CO5	Have knowledge about applications in fields of engineering, physics, economics, and biology

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–II

MATHEMATICS

COURSE CODE: M-201

COURSE TITLE: PAPER–I: CALCULUS AND DIFFERENTIAL EQUATIONS

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3Hours (THEORY: 38
MEDIUM: English INTERNAL ASSESSMENT: 12)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV respectively.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Calculus is a branch of mathematics focused on limits, functions, derivatives, integrals, and infinite series.
- Calculus has widespread applications in science, economics, and engineering and can solve many problems for which algebra alone is insufficient.
- The main objective of differential equations is to introduce the students to the exciting world of differential equations and their applications.
- In applications, the functions generally represent physical quantities, the derivatives represent their rates of change, and the differential equation defines a relationship between the two.
- Differential equations have applications in fields of engineering, physics, economics, and biology.

COURSE CONTENT:

Unit-I

Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple Points, Curvature, Tracing of Curves (Cartesian and Parametric coordinates only).

Unit-II

Integration of hyperbolic functions. Reduction formulae. Definite integrals. Fundamental theorem of integral calculus. Quadrature, rectification.

Academic Session 2021-22

Unit-III

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's Form and singular solutions. Geometrical meaning of a differential equation. Orthogonal Trajectories.

Unit-IV

Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series Method, Bessel and Legendre equations (only series solution).

BOOKS PRESCRIBED:

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longman (India), 1967.
2. G.F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. E.A. Codington: An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.
4. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
5. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.
6. Shanti Narayan and P.K. Mittal: Integral Calculus, S Chand & Company.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get acquainted with the limits, functions, derivatives, integrals, and infinite series.
CO2	Associate differential equations with the Mathematical modeling.
CO3	Solve multifarious differential equation that relates functions with its derivatives.
CO4	Know about concavity and convexity of the functions, Asymptotes and multiple points of a curve.
CO5	Have knowledge about applications in fields of engineering, physics, economics, and biology.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–II

MATHEMATICS

COURSE CODE: M-202

COURSE TITLE: PAPER–II: CALCULUS

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 37
INTERNAL ASSESSMENT: 13)

TIME: 3Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV respectively.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- This course introduces the concept of partial derivatives which are used in fields such as computer graphics, physical sciences, vector calculus and engineering.
- Evaluate double and triple integrals of functions of several variables. Apply them in evaluating area and volume of solids.
- This course covers the concepts of jacobians, maxima and minima of functions of two variables, envelopes and evolutes.

COURSE CONTENT:

Unit-I

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem, Statements of Inverse and implicit function theorems and applications.

Unit-II

Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and saddle points of functions of two Variables.

Unit-III

Lagrange's undetermined multiplier method. Double and Triple Integrals, Change of variables, Change of order of integration in double integrals.

Academic Session 2021-22

Unit-IV

Applications to evaluation of Areas, Volumes, Surfaces of solid of revolution.

BOOKS PRESCRIBED:

1. Narayan, S. & **Mittal**, P.K. : Integral Calculus, S. Chand & Co.
2. Kreyszig, E.: Advanced Engineering Mathematics.
3. Narayan S. & Mittal, P.K. : Differential Calculus, S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Apply Calculus in various fields such as computer graphics, physical sciences, economics and engineering.
CO2	Use Calculus in oceanography to calculate the height of tides in oceans.
CO3	Understand the concept of partial derivatives which are used in fields such as computer graphics, physical sciences, vector calculus and engineering.
CO4	Learn about evaluating double and triple integrals of functions of several variables and apply them in evaluating area and volume of solids.
CO5	Understand the concepts of jacobians, maxima and minima of functions of two variables, envelopes and evolutes.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–III

MATHEMATICS

COURSE CODE: M-301

COURSE TITLE: PAPER–I: ANALYSIS

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 38
INTERNAL ASSESSMENT: 12)

TIME: 3Hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Analysis is the branch of mathematics that studies the behavior of real numbers, sequences and series of real numbers and real functions.
- The content of this course is designed to make the students understand to work comfortably with completeness of real line, to test the convergence of sequences and series of various types and the convergence of improper integrals.
- The content of this course helps to solve Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

COURSE CONTENT:

Unit-I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral tests. Ratio tests. Cauchy's root test. Raabe's test, Logarithmic test. Demorgan's and Bertrand's tests. Kummer's test, Cauchy Condensation test, Gauss test, Alternating series. Leibnitz's test, absolute and conditional convergence.

Unit-II

Partitions, Upper and lower sums. Upper and lower integrals, Riemann integrability. Conditions of existence of Riemann integrability of continuous functions and of monotone functions. Algebra of integrable functions. Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.

BOOKS PRESCRIBED:

1. Malik, S.C & Arora, Savita.: Mathematical Analysis, Wiley Eastern Ltd. (1991).
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974).
3. Narayan, S & Mittal, P.K.: Integral Calculus, S. Chand & Co.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Study the behavior of real numbers, sequences and series of real numbers.
CO2	Test the convergence of sequences and series of various types, the convergence of improper integrals.
CO3	Apply the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–III

MATHEMATICS

COURSE CODE: M-302

COURSE TITLE: PAPER–II: ANALYTICAL GEOMETRY

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3Hours **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of seven compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Analytic geometry is a branch of mathematics that enable the students in understanding and applying the concepts of geometry in the daily life.
- Some of such applications of geometry in different fields are art, robotics, Computer, and video games, architecture, Astronomy and physics, geographic information systems, and also in the construction of stairs making the use of angles of geometry.
- Helps to understand the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions.
- The properties of conics (parabola, ellipse, hyperbola and sphere) are also to be studied.

COURSE CONTENT:

Unit-I

Transformation of axes, shifting of origin, Rotation of axes, The invariants, Joint equation of pair of straight lines, equations of bisectors, Parabola and its properties. Tangents and normals, Pole and polar, pair of tangents at a point, Chord of contact, equation of the chord in terms of mid point and diameter of conic.

Unit-II

Ellipse and hyperbola with their properties. Tangents and normals, Pole and polar. Pair of

tangents at a point, Chord of contact, Identifications of curves represented by second degree equation (including pair of lines). Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Change of axes, Shift of origin, rotation of axes. Sphere, Section of a sphere by a plane, spheres of a given circle. Intersection of a line and a sphere. Tangent line, tangent plane, power of a point w.r.t. a sphere, radical planes.

BOOKS PRESCRIBED:

1. Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry.
2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London.
3. Narayan, S. & Mittal, P.K.: Analytical Solid Geometry, S. Chand & Co.
4. Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons.
5. Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand and apply the concepts of geometry in the daily life.
CO2	Analyse the applications of geometry in different fields such as art, robotics, Computer, and video games.
CO3	Understand the important role of Analytical Geometry in architecture and also in the construction of stairs by making use of angles.
CO4	Comprehend the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions.
CO5	Know about the properties of conics (parabola, ellipse, hyperbola and sphere).

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)
SEMESTER–IV
MATHEMATICS
COURSE CODE: M-401
COURSE TITLE: PAPER–I: STATICS AND VECTOR CALCULUS

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3Hours **(THEORY: 38**
MEDIUM: English **INTERNAL ASSESSMENT: 12)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the resolution and composition of a number of forces.
- The content of this course gives the concept of parallel forces and couples, the concept of moments of forces and couples about a point and a line, friction and its applications.
- The course gives a detail information about the differentiation and integration of vector functions, properties of gradient, divergence and curl, the applications of Gauss divergence theorem, Stoke's theorem and Green's theorem.

COURSE CONTENT:

Unit-I

Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami's

Theorem, λ - μ theorem). Resultant of a number of coplanar forces, parallel forces. Moments, Varignon‟s theorem of moments, Couples, Resultant of two Coplanar Couples, Equilibrium of two coplanar couples, Resultant of a force and a couple. Equilibrium of coplanar forces. Friction, Laws of friction, Equilibrium of a particle on a rough plane. Centre of Gravity: Centre of gravity of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

Unit-II

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, Vector integration, Theorems of Gauss, Green, Stokes and problems based on these.

BOOKS PRECRIBED:

1. S.L. Loney: Statics, Macmillan and Company, London.
2. R.S. Verma: A Text Book on Statics, Optical Pvt. Ltd., Allahabad.
3. Spiegal, M.R.: Introduction to Vector Calculus and Tensor.
4. Spiegal, M.R.: Vector Analysis.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the concept of system of forces in equilibrium and differentiation and integration of vector functions.
CO2	Define the resolution and composition of a number of forces, parallel forces and couples, moments of forces and couples about a point and a line.
CO3	Generalise the theory behind the friction and centre of gravity.
CO4	Understand the definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
CO5	Apply concept of a vector integration in a plane and in space.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–IV

MATHEMATICS

COURSE CODE: M-402

COURSE TITLE: PAPER–II: SOLID GEOMETRY

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3Hours (THEORY: 37
MEDIUM: English INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of seven compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- It will help students togeneralises the concepts and ideas of plane geometry.
- It will give students the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure.
- Students will understand its applications in 3-D modelling, Architectural designing, 3-D Computer graphics.
- This subject will make the students to understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

COURSE CONTENT:

Unit-I

Cylinder as surface generated by a line moving parallel to a fixed line and through a fixed curve. Different kinds of cylinders such as right circular, elliptic, hyperbolic and parabolic in standard forms, Cone with a vertex at the origin as the graph of homogeneous equation of second degree in x, y, z. Cone as a surface generated by a line passing through a fixed curve and a fixed point outside the plane of the curve, right circular and elliptic cones.

Unit-II

Equation of surface of revolution obtained by rotating the curve $f(x,y)=0$ about the z-axis in the form of $f(x^2+y^2,z)=0$.Equation of ellipsoid, hyperboloid and paraboloid in standard forms. Surfaces represented by general equation of 2^{nd} degree $S = 0$. Tangent lines, tangent planes and

Normal plane.

BOOKS PRESCRIBED:

1. Narayan, S. & Mittal, P.K. : Analytical Solid Geometry, S. Chand & Co.
2. Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons.

COURSE OUTOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the concept of 3-D Euclidean geometry.
CO2	Generalise the concepts and ideas of plane geometry.
CO3	Understand the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure.
CO4	Learn about the applications of solid geometry in 3-D modelling, Architectural designing, 3-D Computer graphics.
CO5	Understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–V

MATHEMATICS

COURSE CODE: M-501

COURSE TITLE: PAPER–I: DYNAMICS

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 38
INTERNAL ASSESSMENT: 12)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
3. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- To understand the motion of particles in a straight line with constant acceleration.
- To get familiar with Newton's laws of motion.
- To understand the curvilinear motion, simple harmonic motion and the concept of work, power and energy.

COURSE CONTENT:

Unit–I

Rectilinear motion in a straight line with uniform acceleration, Newton's laws of motion. Motion of two particles connected by a string. Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit–II

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum. Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

Academic Session 2021-22

BOOKS PRESCRIBED:

1. S.R.Gupta: A text book of Dynamics
2. F. Chorlton: Dynamics.
3. S.L. Loney: An Elementary Treatise on the Dynamics of a Practice and of Rigid Bodies, Cambridge University Press, 1956.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Understand the concept of 3-D Euclidean geometry.
CO2	Generalise the concepts and ideas of plane geometry.
CO3	Understand the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure.
CO4	Learn about the applications of solid geometry in 3-D modelling, Architectural designing, 3-D Computer graphics.
CO5	Understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)
SEMESTER–V
MATHEMATICS
COURSE CODE: M-502
COURSE TITLE: PAPER–II: NUMBER THEORY

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
TIME: 3Hours **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of seven compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Number theory is a branch of pure mathematics devoted primarily to the study of integers and integer-valued functions.
- Number theory have countless applications in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- The content of this course is designed to make the students understand the various types of numbers and their properties, various arithmetic functions, the concept of congruences to solve various arithmetic problems, G.C.D. and L.C.M. of numbers and the relation of linear Diophantine equations and congruences.

COURSE CONTENT:

Unit–I

The division algorithm, The greatest common divisor, least common multiple, The Euclidean alogrithm, The Diophantine equation ax + by = c Prime numbers and their distribution, The fundamental theorem of arithmetic, Basic properties of congruences, Linear congruences, Special divisibility tests.

Unit–II

Chinese remainder theorem, The Fermat's theorem, Wilson's theorem, τ and σ functions, Mobius Inversion formula, Greatest integer function, Euler's Phi function, Euler's theorem, some properties

of the Phi Function. Application to Cryptpgraphy- Factorization methods due to Fermat, RSA.

BOOKS PRESCRIBED:

1. D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope inChapters 2-5, 7-12)., 2005
2. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Know about some fascinating discoveries related to properties of prime numbers.
CO2	Interpret the concept of divisibility and fundamental theorem of Arithmetic.
CO3	Have knowledge on the applications such as security system used in banking securities, coding theory, barcodes and memory management systems.
CO4	Understand the various types of numbers and their properties, various arithmetic functions.
CO5	Understand the concept of G.C.D. and L.C.M. of numbers and the relation of linear Diophantine equations and congruences, helpful in solving various arithmetic problems.

- .

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–VI

MATHEMATICS

COURSE CODE: M-601

COURSE TITLE: PAPER–I: LINEAR ALGEBRA

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 38
INTERNAL ASSESSMENT: 12)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of eight compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week

COURSE OUTCOMES:

- To understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
- To get familiar with Quotient space, Direct sum, linear span and linear independence.
- To understand the concept of Rank and nullity of linear transformations.
- To relate matrices and linear transformations.

COURSE CONTENT:

Unit–I

Definition of groups, rings and fields with examples. Definition of a vector space, subspaces with examples. Direct sum of subspaces. Linear span, Linear dependence, Linear independence of vectors. Linear combination of vectors, Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis. Invariance of the number of elements of the basis set. Dimension of sum of two subspaces. Quotient space and its dimension.

Unit–II

Linear transformation. Algebra of linear transformation. Rank- Nullity theorem, Isomorphism and Isomorphic spaces, Matrix of a linear transformation. Changes of basis, Linear operator.

BOOKS PRESCRIBED:

1. K.Hoffman & R. Kunze: Linear Algebra, 2nd Edition, Prentice Hall, New Jersey, 1971.
2. V. Krishnamurthy, V. P. Mainra and J.L. Arora: An Introduction to Linear Algebra, East West Press, 1976.
3. Shanti Narayan & P.K. Mittal: A Text Book of Matrices, 10th Edition (2002), S.Chand & Co.
4. Surjit Singh: Linear Algebra, 1997.

COURSE OUTCOMES:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Handle the problems based on vector spaces, subspaces, basis and dimensions.
CO2	Check the linear independence of vectors.
CO3	Form the linear combination of vectors.
CO4	Find the matrix corresponding to a linear transformation and vice versa.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–VI

MATHEMATICS

COURSE CODE: M-602

COURSE TITLE: PAPER–II: NUMERICAL ANALYSIS

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 50
(THEORY: 37
INTERNAL ASSESSMENT: 13)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B from Unit-I and Section–C from Unit-II.
2. The Section–A will consist of seven compulsory questions, each of one mark.
3. The Section–B &C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from section-B & C. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.
5. Use of Non-programmable scientific calculator is allowed.

COURSE OBJECTIVES:

- Numerical analysis naturally finds application in all the fields of engineering and the physical sciences, but in the 21st century also the life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.
- The content of this course is designed to make the students understand the use of Numerical analysis in detecting errors in numerical calculations,
- It enable the students to solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.

COURSE CONTENT:

Unit–I

Error generation, propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Iteration method, Newton's Method, Generalized Newton's Method, Method of false position, Muller's method, Rate of convergence of these methods. Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi's Method, Gauss Seidel Method. Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator.

Academic Session 2021-22

Unit–II

Interpolation with divided difference, Newton's formula, Lagrangian Method, Finite difference interpolation, Gauss formula, Stirling formula, Bessel's formula, Error Estimation Extrapolation. Numerical differentiation, Method based on interpolation. Numerical Integration, Trapezoidal rule, Simpson's rule, Weddle rule, Romberg Integration, Gaussian integration method, Gaussian legendre integration. Double numerical integration. Numerical solution of ordinary differential equations, Initial value problem, Taylor's method, Euler's methods, Picard's method, Milne's Method, Runge-Kutta Method. Predictor- Corrector's Method.

BOOKS PRESCRIBED:

1. S.S. Sastry: Introductory Methods of Numerical Analysis, 2003 (3rd Edition), Prentice Hall of India.
2. A. Maritava Gupta and Subash Ch. Bose: Introduction to Numerical Analysis.

COURSE OUTCOMES:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the use of Numerical analysis in detecting errors in numerical calculations.
CO2	Solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.
CO3	Have the knowledge on the study of algorithms that use numerical approximation for the problems of mathematical analysis.
CO4	Apply numerical analysis in all the fields of engineering, physical sciences, life sciences, social sciences, medicine, business and Economics.
CO5	Analyze and evaluate the accuracy of common numerical methods.

Academic Session 2021-22

Scheme of course B.A.
(Subject Statistics)

Semester-I

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	S-101	Statistical Methods–I	30	10	15	05	60	60
2.	S-102	Probability	30	10	-	-	40	60

Semester-II

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	S-201	Statistical Methods–II	26	9	11	04	50	60
2.	S-202	Probability Distributions	26	9	11	04	50	60

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.A. (Semester System) (12+3 System of Education)
Semester-I
COURSECODE: S-101

COURSE TITLE: PAPER–I: STATISTICAL METHODS–I

CREDIT HOURS (PER WEEK):4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 35
(THEORY: 26
THEORY INTERNAL ASSESSMENT: 09)

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV respectively.
2. The Section–A will consist of five compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries five marks.
4. Teaching time for theory paper would be six periods per week and two periods per week for practical.

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will learn the meaning and scope of Statistics.

COURSE CONTENT:

Unit-I

Meaning and scope of statistics, Collection of data, presentation of data, diagrammatic representation of data. Attributes and variables, discrete and continuous frequency distribution of a variable, graphical representation of frequency distribution of a variable.

Academic Session 2021-22

Unit-II

Central tendency: Measures of central tendency, namely, Arithmetic mean, median, mode, Geometric mean, Harmonic mean and their comparisons with an ideal measure of central tendency.

Unit-III

Dispersion and its measures, range, mean deviation, quartile deviation and standard deviation. Advantages of standard deviation as measure of dispersion over the other measures, Relative measures of dispersion, coefficient of variation.

Unit-IV

Central and non–central moments, central–moments expressed in terms of moments about an arbitrary origin and vice-versa. Sheppard's correction for moments. Skewness and its measures, Kurtosis and its measures.

BOOKS PRESCRIBED:

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.
2. Croxton F.E., Cowden, D.J. and Kelin, S. (1973): Applied General Statistics, Prentice Hall of India.
3. Goon, A.M. Gupta, M.K. and Dasgupta B.: Fundamentals of Statistics, Vol. I, World Press, 2005.

Books Suggested for Supplementary Reading:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B.: Basic Statistics, World Press, 2005.
2. Gupta, S.C.: Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn to solve Statistical problems using various measure of central tendency.
- Collect the data and present it diagrammatically.
- Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
- Apply the statistical methods in various fields such as finance, marketing, accounting and business.

Sr. No.	On completing the course, the students will be able to:
CO1	Learn to solve Statistical problems using various measure of central tendency.
CO2	Collect the data and present it diagrammatically.
CO3	Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
CO4	Apply the statistical methods in various fields such as finance, marketing, accounting and business.
CO5	Learn to solve Statistical problems using various measure of central tendency.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-I

COURSE CODE: S-103

COURSE TITLE: Practical based on PAPER: STATISTICAL METHODS–I

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs.
MAXIMUM MARKS: 30
(PRACTICAL: 22
INTERNAL ASSESMENT PRACTICAL: 08)

TIME: 2 Hours
MEDIUM: English

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will solve problems related to measure of dispersion.

COURSE CONTENT:

Academic Session 2021-22

Teaching time for practical paper would be two period per week.

List of practical exercises

1. Exercises on presentation of Data
2. Exercises on measurers of central tendency
3. Exercises on measures of dispersion
4. Exercises on calculation of moments
5. Exercises on measures of Skewness
6. Exercises on measures of Kurtosis

Students are required to prepare a practical note book with at least 15 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and another one is external). This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:-

1. Practical Note book: 02
2. Viva – voce: 05
3. Exercises: 08

- **COURSE OUTCOMES:**

Sr. No.	**On completing the course, the students will be able to:**
CO1	• Learn to solve Statistical problems using various measure of central tendency.
CO2	• Collect the data and present it diagrammatically.
CO3	• Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
CO4	• Apply the statistical methods in various fields such as finance, marketing, accounting and business.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-I

COURSE CODE: S-102

COURSE TITLR: PAPER–II: PROBABILITY

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 35
(THEORY: 26
INTERNAL ASSESSMENT: 09)

TIME: 3 hours

MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV

respectively.

2. The Section–A will consist of five compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries five marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Students will acquaint themselves with the foundation of probabilistic analysis.
- It will enable the students to quantify the uncertainty and assess the accuracy of our inferenceabout the population.
- Students will have good understanding of exploratory data analysis.

COURSE CONTENT:

Unit-I

Random experiments, sample space, events, mutually exclusive and exhaustive events, algebra of events, various definitions of the probability, axiomatic probability function and its properties.

Unit-II

Finite sample spaces; equally likely outcomes, additive law of probability, conditional probability, multiplicative law of probability, independent events. Baye's Theorem and its applications.

Unit-III

Random variable, examples of random variables, Discrete and continuous random variables, probability mass function and density function, cumulative distribution function, Properties of distribution function of discrete and continuous random variables. Real valued functions of one dimensional random variables and the procedures of finding the probability distribution functions of such functions illustrated by examples.

Unit-IV

Expected value of a random variable and of functions of one dimensional random variable. Properties of expected values. variance of random variable and its properties. Moment generating function and its properties.

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007
3. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

COURSE OBJECTIVES: On completing the course, the students will be able to:

- Use statistics in engineering and science like disease modeling, climate prediction networks etc.
- To quantify the uncertainty and assess the accuracy of our inference about the population.
- Have good understanding of exploratory data analysis.

- Learn the concept of random variable, expected value and moment generating function of random variable.

Sr. No.	**On completing the course, the students will be able to:**
CO1	Use statistics in engineering and science like disease modeling, climate prediction networks etc.
CO2	To quantify the uncertainty and assess the accuracy of our inference about the population.
CO3	Have good understanding of exploratory data analysis.
CO4	Learn the concept of random variable, expected value and moment generating function of random variable.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-II

COURSE CODE: S-201

Academic Session 2021-22

COURSE TITLE: STATISTICAL METHODS – II

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
(MAXIMUM MARKS: 35
THEORY: 26
TIME: 3 hours **THEORY INTERNAL ASSESSMENT: 9)**
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III & IV respectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries four marks.
4. Teaching time for theory paper would be six periods per week and two periods per week for practical.

COURSE OBJECTIVES:

- Students wil understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will use Method of association and contingency table to find the independence of the attributes.

COURSE CONTENT:

UNIT-I

Bivariate data, scatter diagram, covariance, Karl–Pearson's correlation coefficient and its properties, calculation of correlation coefficient from grouped data, bounds of the correlation coefficient, interpretation of the value of the correlation coefficient.

UNIT-II

Spearman’s rank correlation coefficient, The principle of least squares, fitting of straight line, polynomials, exponential, logarithmic curve.

UNIT-III

Regression lines, relation between correlation coefficient and regression coefficients.

UNIT-IV

Independence and association of attributes, measures of association,contingency table.

BOOKS PRESCRIBED:

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:-

Academic Session 2021-22

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Basic Statistics, World Press, 2005.
2. Gupta, S.C., Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn to establish linear association between two variables by using Correlation.
- Find the best fit for a set of data points with the help of method of least square.
- Use regression to predict the behavior of dependent variable.
- Use method of association and contingency table to find the independence of the attributes.
- Use statistical methods in the future prediction for various observations in different fields like business analysis, artificial intelligence, financial analysis, fraud detection, share market and pharmaceutical sector and other industries.

Sr. No.	**On completing the course, the students will be able to:**
CO1	Learn to establish linear association between two variables by using Correlation.
CO2	Find the best fit for a set of data points with the help of method of least square.
CO3	Use regression to predict the behavior of dependent variable.
CO4	Use method of association and contingency table to find the independence of the attributes.
CO5	Use statistical methods in the future prediction for various observations in different fields like business analysis, artificial intelligence, financial analysis, fraud detection, share market and pharmaceutical sector and other industries

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-II

COURSE CODE: S-202

COURSE TITLE: Probability Distributions

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS:60 hrs
MAXIMUM MARKS: 35
(THEORY: 26
THEORY INTERNAL ASSESSMENT: 9

TIME: 3 hours
MEDIUM: English

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV respectively.
2. The Section–A will consist of six compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries four marks.
4. Teaching time for theory paper would be six periods per week and two periods per week for practical.

COURSE OBJECTIVES:

- Students will apply the probability distribution in real life situations such as Business Analysis, Artificial Intelligence, Financial Analysis, Fraud Detection etc.
- Students will realize difference between discrete and continuous distributions.
- Students will know about distributions to study the behavior of two random variables.

COURSE CONTENT:

Unit–I

Discrete Distributions: Uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, Poisson distribution as limiting form of Binomial distribution, Fittings of Binomial and Poisson distributions,

Unit–II

Geometric distribution, Pascal distribution and Hyper geometric distribution. Properties,

expected value, variance and moment generating functions of these distributions.

Unit–III

Continuous Distributions: Normal distribution, Fitting of normal distribution, Exponential distribution, Uniform distribution.

Unit–IV

Gamma distribution, Beta distribution. The properties of these distribution including their expected values, variances and moment generating functions

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.
3. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- To differentiate discrete and continuous distributions.
- Know about distributions to study the behavior of two random variables.
- Study the discrete distributions such as bernoulii, binomial, poisson etc.
- Learn about continuous distributions such as exponential, normal, uniform etc.

Sr. No.	**On completing the course, the students will be able to:**
CO1	To differentiate discrete and continuous distributions.
CO2	Know about distributions to study the behavior of two random variables.
CO3	Study the discrete distributions such as bernoulii, binomial, poisson etc.
CO4	Learn about continuous distributions such as exponential, normal, uniform etc.

Academic Session 2021-22

Khalsa College Amritsar

(An Autonomous College)

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-II

COURSE CODE:S-203

COURSE TITLE: Practical based on PAPER STATISTICAL METHODS–II and PROBABILITY DISTRIBUTIONS

CREDIT HOURS (PER WEEK):
TOTAL HOURS: hrs
MAXIMUM MARKS: 30
(PRACTICAL: 22
INTERNAL ASSESMENT PRACTICAL: 08)

TIME: 2 Hours
MEDIUM: English

COURSE OBJECTIVES:

- Students wil understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will realize difference between discrete and continuous distributions.

COURSE CONTENT:

Teaching time for practical paper would be two period per week per paper.

List of practical exercises

1. Exercises on calculation of Karl Pearsons correlation coefficient
2. Exercises on calculation of Spearman's rank correlation coefficient
3. Exercises on fittings of regression lines, polynomials, exponential and logarithmic curves.
4. Exercises on fittings of Binomial, Poisson and Normal Distributions
5. Exercises on calculation of probabilities for Binomial, Poisson and Normal Distributions

Students are required to prepare a practical note book with at least 15 exercises based upon the

above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the principal of the college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

COURSE OUTOCMES: On completing the course, the students will be able to:

- Find the best fit for a set of data points with the help of method of least square.
- Use regression to predict the behavior of dependent variable
- To differentiate discrete and continuous distributions.
- Know about distributions to study the behavior of two random variables.
- Study the discrete distributions such as bernoulii, binomial, poisson etc.

Sr. No.	**On completing the course, the students will be able to:**
CO1	Find the best fit for a set of data points with the help of method of least square.
CO2	Use regression to predict the behavior of dependent variable
CO3	To differentiate discrete and continuous distributions.
CO4	Know about distributions to study the behavior of two random variables.
CO5	Study the discrete distributions such as bernoulii, binomial, poisson etc.