Khalsa College Amritsar

(An Autonomous College)

Faculty of Mathematical Sciences

Syllabus: Mathematics

Session 2020-21

(ii) Subject to change in the syllabi at any time.

Please visit the college website time to time.

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Scheme of Course B.Sc. (Hons.) Mathematics 3

Eligibility:- The Candidate having passed 10+2 Examination (Non-Medical) from recognized board. **Semester-I**

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHMH-101	Differential Calculus	37	13	50	45
2.	BHMH-102	Co-ordinate Geometry	37	13	50	45
3.	BHMH-103	Algebra-I	37	13	50	45
4.	BHMH-104	Physics-I Optics	37	13	50	45
5.	BHMH-105	Organic Chemistry-I	37	13	50	45
6.	BHMH-106	Communicative English	37	13	50	45
7.	BHMH-107(A) BHMH-107(B)	Punjabi Compulsory OR Basic Punjabi	37	13	50	45
8.	BHMH-108	Physics Lab-I (Optics Lab)	22	8	30	30
9.	BHMH-109	Organic Chemistry Practical-I	22	8	30	30
10.	BHMH-110	Math Lab-I	30	10	40	30
11.	DA 1*	**DrugAbuse**:Problem, Management and Prevention Problem Of Drug Abuse	50		50	2Lectures / Week
Total			333	117	450	405 Hrs. +2Lect./ Week

* Pass Course

Semester-II

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assesment in theory	Total	Hrs.
1.	BHMH-201	Integral Calculus	37	13	50	45
2.	BHMH-202	Solid Geometry	37	13	50	45
3.	BHMH-203	Algebra-II	37	13	50	45
4.	BHMH-204	Physics-II Modern Physics	37	13	50	45
5.	BHMH-205/	Inorganic Chemistry-II	37	13	50	45
6.	BHMH-206	Communicative English	37	13	50	45
7.	BHMH-207(A) BHMH-207(B)	Punjabi Compulsory OR Basic Punjabi	37	13	50	45
8.	BHMH-208	Physics Lab-II	22	8	30	30
9.	BHMH-209	Inorganic Chemistry Practical-II	22	8	30	30
10.	BHMH-210	Math Lab-II	30	10	40	30
11.	DA 2*	**DrugAbuse**:Problem, Management and Prevention Drug Abuse: Management and Prevention	50		50	2Lectures/ Week
Total			333	117	450	405 Hrs. +2Lect./ Week

*Pass Course

Semester-III **5**

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHMH-301	Trigonometry and Advanced Calculus	56	19	75	45
2.	BHMH-302	Analysis	56	19	75	45
3.	BHMH-303	Physics-III Electricity And Magnetism	37	13	50	45
4.	BHMH-304	Physical Chemistry-III	37	13	50	45
5.	BHMH-305/ ESL221	Environmental studies-I*	50	-	50	2 Lectures/Week
6.	BHMH-306	Interdisciplinary Course ID-I Psychology	37	13	50	45
7.	BHMH-307	Physics Lab-III	37	13	50	45
8.	BHMH-308	Physical Chemistry Lab- III	37	13	50	45
Total			297	103	400	345Hrs.+ 2 Lectures/ Week

*Pass Course

Semester-IV

Sr.No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHMH-401	Mathematical Modelling and Differential Equations	56	19	75	45
2.	BHMH-402	Statics and Vector calculus	56	19	75	45
3.	BHMH-403	Physics-IV	37	13	50	45
4.	BHMH-404	Molecular Spectroscopy-IV	37	13	50	45
5.	BHMH-405/ESL 222	Environmental studies-II*	50	-	50	2 Lectures/Week
6.	BHMH-406	Interdisciplinary Course ID-II Geography	30+7(Practical)	13	50	45
7.	BHMH-407	Physics Lab-IV	37	13	50	45
8.	BHMH-408	Physical Chemistry Lab- IV	37	13	50	45
Total			297	103	400	345Hrs.+ 2Lectures/ Week

*Pass Course

Semester-V **7**

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHMH-501	Probability and Statistics	56	19	75	45
2.	BHMH-502	Group Theory	56	19	75	45
3.	BHMH-503	Number Theory	56	19	75	45
4.	BHMH-504	Partial Differtential Equations	56	19	75	45
5.	BHMH-505	Introduction to Python	57	18	75	45
6.	BHMH-506	Seminar and Assignment	20	5	25	15
Total			301	99	400	240

Semester-VI 8

Sr. No.	Course No.	Course Title	Theor Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHMH-601	Linear Programming	56	19	75	45
2.	BHMH-602	Numerical Methods	56	19	75	45
3.	BHMH-603	Discrete Mathematics and Graph Theory	56	19	75	45
4.	BHMH-604	Dynamics	56	19	75	45
5.	BHMH-605	Ring Theory and Linear Algebra	56	19	75	45
6.	BHMH-606	Seminar and Assignment	20	5	25	15
Total			300	100	400	240

Scheme for M.Sc. Mathematics

Semester-I

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHM-101	Real Analysis-I	75	25	100	60
2.	MHM-102	Algebra-I	75	25	100	60
3.	MHM-103	Linear Algebra	75	25	100	60
4.	MHM-104	Number Theory	75	25	100	60
5.	MHM-105	Complex Analysis	75	25	100	60
6.	MHM-106	Differential Equations	75	25	100	60
Total			450	150	600	360

Semester-II

Sr. No.	Course No.	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHM-201	Real Analysis-II	75	25	100	60
2.	MHM-202	Algebra-II	75	25	100	60
3.	MHM-203	Probability Theory	75	25	100	60
4.	MHM-204	Classical Mechanics and Calculus of variation	75	25	100	60
5.	MHM-205	Differential Geometry	75	25	100	60
6.	MHM-206	Mathematical Methods	75	25	100	60
Total			450	150	600	360

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	Measure Theory	75	25	-	-	100	60
2.	MHM-302	Functional Analysis-I	75	25	-	-	100	60
3.	MHM-303	Statistical Inference	55	25	15	05	100	60
4.	MHM-304	Operations Research-I	75	25	-	-	100	60
5.	MHM-305	Discrete Mathematics-I	75	25	-	-	100	60
6.	MHM-306	Introduction to Computer and Information Technology	56	19	18	07	100	45
Total			411	144	33	12	600	345

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	60
2.	MHM-402	Functional Analysis-II	75	25	-	-	100	60
3.	MHM-403	Field Extension and Galois theory	75	25	-	-	100	60
4.	MHM-404	Operations Research-II	75	25	-	-	100	60
5.	MHM-405	Discrete Mathematics-II	75	25	-	-	100	60
6.	MHM-406	Programming in C	56	19	18	07	100	45
Total			431	144	18	07	600	345

Scheme of course B.A. /B.Sc.

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	45
2.	M-102	Calculus and Trigonometry	37	13	50	45

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	45
2.	M-202	Calculus	37	13	50	45

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	45
2.	M-302	Analytical Geometry	37	13	50	45

Semester-IV

Sr. No.	Course No.	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	M-401	Statics and Vector Calculus	38	12	50	45
2.	M-402	Solid Geometry	37	13	50	45

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	45
2.	M-502	Number Theory	37	13	50	45

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	45
2.	M-602	Numerical Analysis	37	13	50	45

Khalsa College Amritsar

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Syllabus for

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

BHM-101

Differential Calculus

Time: 3 Hours **Max. Marks: 50**

Medium: English **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

Differential calculus is a branch of calculus concerned with the theory and applications of derivatives. Differential 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.

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. 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.

Unit-I

Limit of a function, Basic property of limits, Continuous functions and classifications of discontinuities, Differentiation (Trigonometric and Inverse Trigonometric, Hyperbolic, Logarithimic, Parametrically defined functions, Implicit functions), Successive Differentiation, Leibnitz's Theorem, Taylor's and Maclaurin's theorem.

Unit-II

Tangents and Normals, Rolle's Theorem, Langrange's Mean Value theorem, Cauchy's Mean Value Theorem, Maxima and Minima (Single Variable), Indeterminate forms, Concavity and Points of inflexion, Asymptotes, Curvature and Evolutes.

Books Recommended:

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH- 102

Co-ordinate Geometry

Time: 3 Hours **Max. Marks: 50**

Medium: English **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

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 dimensions. The properties of conics (parabola, ellipse, hyperbola) are also to be studied.

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. 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.

Unit-I

Transformation of axes, shifting of origin, Rotation of axes, the invariants, joint equation of pair of straight lines, equations of bisectors. Identification of curves represented by second degree equation (including pair of lines).

Unit-II

Parabola, Ellipse and Hyperbola with their properties. Tangents and normal, Pole and polar, pair of tangents at a point, Chord of contact, equation of the chord in terms of midpoint and diameter of conic.

Books Recommended

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. P.K Jain and Khalil Ahmed, Analytical Geometry Part I (3rd.Edition) New Age Publication House

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
BHMH-103
Algebra-I

Time: 3 Hours **Max. Marks: 50**
Medium: English **Theory Marks: 37**
Internal Assessment: 13

Objectives and Applications:

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 and basic concepts of number theory. Algebra describes the fundamental properties of real numbers that lead to the formal development of Real Analysis. Students are able to recognize technical terms and appreciate some of the uses of tools of algebra.

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. 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 for each paper.

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

Unit-II

Theorems on consistency of a system of linear equations. 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.Equivalence relations, Functions, Composition of functions, Invertible functions , One to one correspondence and cardinality of a set, Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, statement of Fundamental Theorem of Arithmetic.

Books Recommended

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
BHMH -104: Physics-I
Optics

Medium: English
Time: 3 Hours **Total Marks: 50**
Total Lectures: 60 **(Max. Marks: 37+Internal Assessment: 13)**
Pass Marks: 35%

Note for paper setter and students:

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.**

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.

Text Reference Books:

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

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
BHMH-105

Organic Chemistry-I

Medium: English
Time: 3 Hours **Total Marks:50**
(Max. Marks: 37+Internal Assessment: 13)
Total Lectures: 60 **Pass Marks: 35%**

Instructions for paper setters and students:

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.

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: conformationalanalysis 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 substitution and addition reaction:

(a) Functional group transformation by nucleophilicsubstituion, mechanismof nucleophilic substitution (SN^1/SN^2), stereochemistry of SN^1/SN^2 reactions, steric effect in SN^2 reactions, nucleophiles and nucleophilicity, carbocation stability and the rate of substitution, by the SN^1 mechanism, stereochemistry of SN^1 reactions, carbocation rearrangements in SN^1 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

Text and Reference Books:

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.

Khalsa College Amritsar

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(An Autonomous College)
Syllabus for
B.Sc. (Hons.) Mathematics/Physics/Chemistry
SEM-I
BHMH-106
COMMUNICATIVE ENGLISH

TIME: 3 Hrs **Max. Marks: 50**
Theory: 37
Internal Assessment: 13

Course Contents:

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, Second 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 master "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.

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.

Suggested paper pattern:-

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)**

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

B.Sc. (Hons. – Physics, Chemistry, Mathematics), B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC

SEM-I

BHMH-107(A)

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁੱਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ (ਭਾਗ ਪਹਿਲਾ -ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ)
ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
(ਲੇਖਕ ਦਾ ਜੀਵਨ ਅਤੇ ਰਚਨਾ/ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)

ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ
ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਕਸਤੂਰੀ ਲਾਲ ਐਂਡ ਸੰਨਜ਼, ਅੰਮ੍ਰਿਤਸਰ।
(ਜੀਵਨੀ 1 ਤੋਂ 9 ਤਕ ਸਾਰ/ ਵਿਸ਼ਾ-ਵਸਤੂ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਪੈਰ੍ਹਾ ਰਚਨਾ (ਤਿੰਨਾਂ ਵਿਚੋਂ ਇੱਕ)
(ਅ) ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ

ਭਾਗ-ਚੌਥਾ

(ੳ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ : ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪ-ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ
(ਅ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ - ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ।
2. ਪਹਿਲੇ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ (08) ਅੰਕ ਹੋਣਗੇ।
3. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਪੰਜਵੇਂ ਭਾਗ ਵਿਚ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ 01-01 ਅੰਕ ਦੇ ਛੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ : ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 37+13 = 50 ਹਨ।

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. (Hons. – Physics, Chemistry, Mathematics),
B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC
SEM-I
BHMH-107(B)

SEMESTER-I
ਮੁੱਢਲੀ ਪੰਜਾਬੀ
(In Lieu of Compulsory Punjabi)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁੱਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ
ਭਾਗ–ਪਹਿਲਾ

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ :

(ੳ) ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ-ਪਛਾਣ : ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ, ਅ, ੲ), ਲਗਾਂ-ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ

(ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

ਭਾਗ–ਦੂਜਾ

ਗੁਰਮੁਖੀ ਆਰਥੋਗਰਾਫੀ ਅਤੇ ਉਚਾਰਨ :

ਸਵਰ, ਵਿਅੰਜਨ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਣ, ਮੁਹਾਰਨੀ, ਲਗ- ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ

ਭਾਗ–ਤੀਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜ :

ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਔਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਲਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਹੋੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) ਵਾਲੇ ਸ਼ਬਦ

ਭਾਗ–ਚੌਥਾ

ਸ਼ੁੱਧ-ਅਸ਼ੁੱਧ ਸ਼ਬਦ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਚਾਰ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੈ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਅੰਕ ਹਨ। **(3x4) =12 ਅੰਕ**
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। **(5x2) =10 ਅੰਕ**
3. ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹਨ। ਇਨ੍ਹਾਂ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। **(2x5) =10 ਅੰਕ**
4. ਭਾਗ ਚੌਥਾ ਵਿਚ ਪੰਜ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਕੇ ਲਿਖਣਾ ਹੋਵੇਗਾ। **(5x1) =05 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 50 ਹਨ।

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
BHMH-108
Physics Lab-I

4 Hrs./Week **45 hrs.**
Max. Marks: 22+8(Internal Assessment)

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.
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

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
Organic Chemistry Practical-I **25**
BHMH-109

Max. Marks: 22+8 (Internal Assessment) **Labs 3 Hrs/week**

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

Suggested Book:

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

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I
BHMH-110 **26**
Math Lab-I

Max. Marks: 40
Theory: 30
Internal Assessment: 10

Labs Hrs. 30

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 Recommended:

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-I

DA1- Drug Abuse: Problem, Management and Prevention **27**

PROBLEM OF DRUG ABUSE

(Compulsory for all Under Graduate Classes)
Medium: Enlish/Punjabi/Hindi

Time: 3 Hours Max. Marks: 50

Instructions for the 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.

UNIT–I

- **Meaning of Drug Abuse**

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: **28**

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, "ਡਰੱਗਜ ਦੁਰਵਰਤੋਂ-(ਨਸ਼ਾਖੋਰੀ) ਸਮੱਸਿਆ,ਪ੍ਰਬੰਧਨ ਅਤੇ ਰੋਕਥਾਮ", 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, "ਡਰੱਗਜ ਦੁਰਵਰਤੋਂ-(ਨਸ਼ਾਖੋਰੀ) ਸਮੱਸਿਆ,ਪ੍ਰਬੰਧਨ ਅਤੇ ਰੋਕਥਾਮ", 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. 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.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

B.Sc. Hons. (Mathematics) Sem-II

BHMH-201

Integral Calculus

Time: 3 Hours **Max. Marks: 50**

Medium: English **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

Integral calculus is a branch of calculus concerned with the theory and applications of integrals. It has many applications in science and engineering. It is used in finding 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. The aim of this course is to get the students familiar with the properties and geometric interpretation of definite integrals, methods of finding area, volume, centre of gravity and moment of inertia.

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. 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.

Unit-I

Integral of a function, definite integrals and their properties, geometrical interpretation of a definite integral, integration by substitution, integration of a rational function, Integration of Trigonometric functions, Integration of hyperbolic functions. Trapezoidal, Simpson‟s and Prismoidal rules. Reduction Formulae

Unit-II

Area enclosed by two curves, Quadrature, Rectification, volume and surface of revolution, C.G. and M.I., Fundamental Theorem of Integral calculus and applications, Beta and Gamma Functions.

Books Recommended:

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) Sem-II
BHMH- 202

Solid Geometry

Time: 3 Hours **Max. Marks: 50**
Medium: English **Theory Marks: 37**
Internal Assessment: 13

Objectives and Applications:

Solid geometry is branch of mathematics and is classical name of 3-D Euclidean geometry. It 29nterfering the concepts and ideas of plane geometry. It gives the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure. Its applications being in 3-D 29nterfer, 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.

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. 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.

Unit-I

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. 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.

Unit-II

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. Conicoids and its classification, Surface of revolution, Intersection of a conicoid and a line, Tangent planes and normals to conicoids.

Books Recommended:

1. Narayan.S. & Mittal P.K. : Analytical Solid Geometry, S. Chand & Co.

2. Kryszig, E. : Advanced Engineering Mathematics, John Wiley & Sons.

3. P.K Jain and Khalil Ahmed, Analytical Geometry Part II (3rd.Edition) New Age Publication House

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) Sem-II
BHMH- 203
Algebra-II

Time: 3 Hours **Max. Marks: 50**
Medium: English **Theory Marks: 37**
Internal Assessment: 13

Objectives and Applications:

Algebra-II is an extension of Algebra-I. It helps the students to understand the relations of linear transformations and matrices, relation of roots and coefficients of polynomials, methods of solving cubic and biquadratic equations and Descarte's rule of signs.

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. 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.

Unit-I

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. Introduction to Demoivre's theorem and its application in finding nth roots of unity.

Unit-II

Relation 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 Cardon method, solution of biquadratic equations by Descarte's and Ferrari's Methods.

Books Recommended

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) Sem-II
BHMH 204: Physics-II **32**
Modern Physics

Medium: English
Time: 3 Hours **Total Marks: 50**
Total Lectures: 60 **(Max. Marks: 37+Internal Assessment: 13)**
Pass Marks: 35%

Note for paper setter and students:

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.**

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.

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)

Reference Books:

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) Sem-II
BHMH-205 **33**
INORGANIC CHEMISTRY –II

Medium: English

Time: 3 Hours **Total Marks:50**
(Max. Marks: 37+Internal Assessment: 13)
Total Lectures: 60 **Pass Marks: 35%**

Instructions for paper setters and students:

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.

UNIT-I **12Hrs**

Co-ordination Chemistry: Introduction, Werner‟s coordination theory, naming of co-ordinatecomplexes.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 ford^1 electronic configurations, L S coupling, Hund‟s rule for finding the ground state terms,Electronic spectral properties of Ist transition series, Orgel Diagrams for $d^1 – d^{10}$ 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.

πAcid 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.

Text and Reference Books:

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.

Khalsa College Amritsar

(An Autonomous College)
Syllabus for

B.Sc. (Hons.) Maths/ Phy./Chem. **35**
Sem-II
COMMUNICATIVE ENGLISH
BHMH 206

TIME : 3 Hrs **Max. Marks: 50**
Theory: 37
Internal Assessment: 13

Course Contents:

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, Second 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.

Suggested paper pattern:-

1. Practical Question on Essay Writing with internal choice as prescribed in *The Written Word.* **(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)**

Khalsa College Amritsar

(An Autonomous College)
Syllabus for

B.Sc. (Hons. – Physics, Chemistry, Mathematics), 36
B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC
BHMH 207(A)
SEMESTER-II
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁੱਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ (ਭਾਗ ਦੂਜਾ – ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ)
ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
(ਕਿਸੇ ਲੇਖ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ ਦਾ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ
ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਕਸਤੂਰੀ ਲਾਲ ਐਂਡ ਸੰਨਜ਼, ਅੰਮ੍ਰਿਤਸਰ।
(ਜੀਵਨੀ 10 ਤੋਂ 18 ਤਕ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ-ਰਚਨਾ – ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਮੁੱਢਲੇ ਸੰਕਲਪ
(ਅ) ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ

ਭਾਗ-ਚੌਥਾ

(ੳ) ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ
(ਅ) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

ਅਮਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ।
2. ਪਹਿਲੇ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ (08) ਅੰਕ ਹੋਣਗੇ।
3. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਪੰਜਵੇਂ ਭਾਗ ਵਿਚ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ 01-01 ਅੰਕ ਦੇ ਛੇ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ।
4. ਪੇਪਰ ਸ਼ੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ : ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦਾ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 37+13 = 50 ਹਨ।

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Khalsa College Amritsar

(An Autonomous College)

Syllabus for

B.Sc. (Hons. – Physics, Chemistry, Mathematics), B.Sc. Bio-Tech./IT/Fashion Designing/Food Sc./BCA, BA-JMC

SEMESTER-II

ਮੁੱਢਲੀ ਪੰਜਾਬੀ

BHMH 207(B)

(In Lieu of Compulsory Punjabi)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁੱਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ :

ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸ਼ਬਦ ਅਤੇ ਵਿਓਾਕਰਨਕ ਸ਼ਬਦ

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਪ੍ਰਕਾਰ :

(ੳ) ਸੰਯੁਕਤ ਸ਼ਬਦ, ਸਮਾਸੀ ਸ਼ਬਦ, ਦੋਜਾਤੀ ਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸ਼ਬਦ ਅਤੇ ਮਿਸਰਤ ਸ਼ਬਦ।

(ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ :

ਇੱਕ-ਵਚਨ ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁਅਰਥਕ ਸ਼ਬਦ, ਸਮਾਨਅਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਲਈ ਇੱਕ ਸ਼ਬਦ, ਸ਼ਬਦ ਜੁੱਟ, ਵਿਰੋਧਅਰਥਕ ਸ਼ਬਦ, ਸਮਨਾਮੀ ਸ਼ਬਦ

ਭਾਗ-ਚੌਥਾ

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ :

ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਭਾਗ ਪਹਿਲਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣੇ ਲਾਜ਼ਮੀ ਹਨ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਅੰਕ ਹਨ । **(3x4)=12 ਅੰਕ**
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। **(5x2)=10 ਅੰਕ**
3. ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹਨ। **(2x5)=10 ਅੰਕ**
4. ਭਾਗ ਚੌਥਾ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨਾ ਹੋਵੇਗਾ। **(1x5)=05 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 50 ਹਨ।

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

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

BHMH 208

Physics Lab-II

4 Hrs./Week **45 hrs.**

Max. Marks: 30

Theory: 22

Internal Assessment: 08

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.

Reference Books :

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

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

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-II
Inorganic Chemistry Practical-II
BHMH-209

Max. Marks: 22+8 (Internal Assesment) **Labs 3 Hrs/week**

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.

Book: Vogel's bo'k on Inorganic Qualitative Analysis

Khalsa College Amritsar

(An Autonomous College)
Syllabus for
B.Sc. Hons. (Mathematics) SEM-II 40
BHMH-210
Math Lab-II

Lab Hrs.30

Max. Marks: 40
Theory: 30
Internal Assessment: 10

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 Recommended:

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.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

DA2- DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
DRUG ABUSE: MANAGEMENT AND PREVENTION
(Compulsory for all Under Graduate Classes)
Medium: Enlish/Punjabi/Hindi

Time: 3 Hours Total Marks: 50

Instructions for the 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.

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.

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 trials.

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. ਡਰੱਗਜ ਦੁਰਵਰਤੋਂ-(ਨਸ਼ਾਖੋਰੀ) ਸਮੱਸਿਆ, ਪ੍ਰਬੰਧਨ ਅਤੇ ਰੋਕਥਾਮਾ' 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

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

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

BHMH-301

Trigonometry and Advanced Calculus

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

Advanced calculus is extension of one variable calculus which is made up of trigonometry and algebra. It is used in oceanography in calculating the height of tides in oceans. To calculate powers and nth roots of complex numbers, solution of algebraic equations using De Moivre's Theorem. To understand the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables. Understand the concept of Partial Derivatives, envelopes and evolutes, jacobians, maxima and minima of functions of two variables.

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.

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.

Books Recommended:

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.

Academic Session 2020-21

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

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

BHMH-302 **44**

Analysis

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

Analysis is the branch of mathematics that studies the behavior of real numbers, sequences and series of real numbers and real functions. Analysis has important applications in science and engineering in the form of Fourier analysis, wavelets and harmonic analysis. The content of this course is designed to make the students understand to work comfortably with completeness of R, to test the convergence of sequences and series of various types, the convergence of improper integrals, the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

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.

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 Recommended:

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.

Chairperson, BoS in Mathematics

Khalsa College Amritsar

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Syllabus for

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

BHMH 303: Physics-III **45**

ELECTRICITY AND MAGNETISM

Medium: English

Time: 3 Hours **Total Marks: 50**

Total Lectures: 60 **(Max. Marks: 37+Internal Assessment: 13)**

Pass Marks: 35%

Note for paper setter and students:

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.**

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,

Reference Books:

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH-304

Physical Chemistry-III

Medium: English

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 37 + Internal Assessment: 13)

Total Lectures: 60 **Pass Marks: 35%**

Instructions for paper setters and students:

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.

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.

Suggested Books

ESSENTIAL:

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)

FURTHER READING:

1. Physical Chemistry by G. M. Barrow, 6th Ed., New York, McGraw Hill, 1996.
2. Physical Chemistry by R. J. Silbey, R. A. Albert &Moungi G. Bawendi, 4th Ed., New York: John Wiley, 2005.

Khalsa College Amritsar

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Syllabus for

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

BHMH-305/ESL221: ENVIRONMENTAL STUDIES–I (COMPULSORY)

Medium: English/Punjabi/Hindi

Time: 3 Hrs. **Max. Marks: 50**

Theory Lectures: 1½ Hours/ Week

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.

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.

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.

References/Books:

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.

Khalsa College Amritsar

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

Medium: English

Time: 3 Hours **Total Marks: 50**
(Max. Marks: 37 + Internal Assessment: 13)
Total Lectures: 60 **Pass Marks: 35%**

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.

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**

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

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 **53**

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.

Suggested Readings:-

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH-307: Physics Lab-III

Time: 4 Hours/Week **Total Marks: 50**

General Guidelines for Practical Examination

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.

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.

Reference Books :

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

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

Khalsa College Amritsar

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Syllabus for

B.Sc. (Hons) Maths Semester-III 56

Physical Chemistry Lab-III

BHMH 308

Max. Marks: 37+13(Internal Assesment) **Labs Hrs.: 60**

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.

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

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

BHMH - 401

Mathematical Modelling and Differential Equations **57**

Medium: English

Time: 3 Hours **Max.Marks: 75**

Theory Marks:56

Internal Assessment: 19

Objectives and Applications:

Mathematical modeling is a powerful, indispensible scientific tool which deals with different aspects of real world, their interaction and their dynamics through mathematical models. Mathematical models are used extensively in all branches such as biology, ecology, medical science, computer science etc. The objective of this paper is to introduce various mathematical models like compartmental model, exponential decay model etc. It also make the students aware about the various concepts of differential equations.

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.

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 Recommended:

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.

Academic Session 2020-21

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

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

BHMH – 402 **58**

Statics and Vector Calculus

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

Statics is the study of system of forces in equilibrium and Vector analysis deals with the differentiation and integration of vector functions. The content of this course is designed to make the students understand the resolution and composition of a number of forces, 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 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.

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.

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 Recommended:

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH 403 Physics-IV

Medium: English

Time: 3 Hours **Total Marks: 50**

Total Lectures: 60 **(Max. Marks: 37+Internal Assessment: 13)**

Pass Marks: 35%

Note for paper setter and students:

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.**

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 Suggested:

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)

Khalsa College Amritsar

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Syllabus for

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

BHMH-404

Molecular Spectroscopy-IV

Medium: English

Time: 3 Hours **Total Marks:50**

(Max. Marks: 37+Internal Assessment: 13)

Total Lectures: 60 **Pass Marks: 35%**

Instructions for paper setters and students:

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.

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 Recommended:

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

Khalsa College Amritsar

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Syllabus for

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

BHMH-405/ESL222: ENVIRONMENTAL STUDIES–II (COMPULSORY)

Medium: English/Hindi/Punjabi

Time: 3 Hrs. **Max. Marks: 50**

Theory Lectures: 1½ Hours/ Week

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.

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.

References/Books:

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.

Khalsa College Amritsar

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Syllabus for

B.Sc. Hons. (Mathematics, Physics, Chemsitry)

Sem-IV

BHMH-406 INTERDISCIPLINARY COURSE ID-II

Geography

Medium: English

Time:- 3 Hours **Max. Marks: 50**

Theory: 30 Marks

Internal Assessment: 13 Marks

Practical: 07 Marks

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)**

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 **65**

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.

Prescribed Text:

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

Khalsa College Amritsar

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Syllabus for

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

BHMH-407: PHYSICS LAB-IV

Time: 4 Hours/Week **Total Marks: 50**

General Guidelines for Practical Examination

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.

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.

Reference Books :

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

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Syllabus for

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

BHMH 408: Physical Chemistry

Lab-IV

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 37 + Internal Assessment: 13)

6 Periods/week **Pass Marks: 35%**

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.

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Syllabus for

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

BHMH 501: Probability and Statistics

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

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. Course enables important understanding to be gained and informed decisions to be made about a population by examining only a small random sample of the members of that population. Probability theory and statistical distributions are needed to quantify the uncertainty and assess the accuracy of our inference about the population. With this course learner will have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set. Learner can become informed consumer of statistical information provided in newspaper, magazine and journals.

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

Unit-I

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions: uniform, binomial, Poisson, geometric, negative binomial, continuous distributions: uniform, normal, exponential

Unit-II

Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables, bivariate normal distribution, correlation coefficient, joint moment generating function (jmgf) and calculation of covariance (from jmgf), linear regression for two variables.

Books Recommended :

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

Khalsa College Amritsar

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Syllabus for

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

BHMH 502: Group Theory

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

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.

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.

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 Recommended:

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH 503: Number Theory

Time: 3 Hours **Max. Marks: 75**
Medium: English **Theory Marks: 56**
Internal Assessment: 19

Objectives and Applications:

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.

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.

Unit-I

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 Recommended:

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH 504: Partial Differential Equations

Time: 3 Hours **Max. Marks: 75**
Medium: English **Theory Marks: 56**
Internal Assessment: 19

Objectives and Applications:

The theory of partial differential equations stems from the intensive and extensive study of a few basic equations of mathematical physics, such equations arise in the study of gravitation, electromagnetism, perfect fluids, elasticity and quantum mechanics. Partial differential equation (PDE) models are used for the 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. After completing the course students will be able to apply PDEs techniques to predict the behaviour of certain real phenomena by identifying them as models of partial derivatives equations and extract information to interpret reality.

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.

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

Derivation of Heat equation, Wave equation and Laplace equation in one and two dimesion. Classification of second order linear equations as hyperbolic, parabolic or elliptic. Reduction of second order Linear Equations to canonical forms.

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: Two Equations in two unknown functions,

Books Recommended :

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH-505

Introduction to Python

Time: 3 Hours **Total. Marks: 75**

Theory Marks: 37

Theory Internal Assessment Marks: 13

Practical Marks: 20

Practical Internal Assessment Marks: 05

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

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

Reference Books:

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

Khalsa College Amritsar

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Syllabus for

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

BHMH 601: Linear Programming

Time: 3 Hours **Max. Marks: 75**
Medium: English **Theory Marks: 56**
Internal Assessment: 19

Objectives and Applications:

Linear programming is a mathematical concept used to determine the solution to a linear problem. The applications of linear programming is in food and agriculture, engineering, transportation systems, efficient manufacturing and energy industry.Typically, the goal of linear programming is to maximize or minimize specified objectives, such as profit or cost. This process is known as optimization. It relies upon three different concepts:- variables, objectives, and constraints.Under this subject, students will understand basic assumptions and properties of linear programming. Use graphical solution process, understanding special situations such as redundancy, infeasibility, unboundedness and alternate optimal solutions in linear programming problems.

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.

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 Recommended

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.

Academic Session 2020-21

Khalsa College Amritsar

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Syllabus for

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

BHMH 602: Numerical Methods

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

Numerical analysis is the study of algorithms that use numerical approximation for the problems of mathematical analysis. 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, to solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.

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 seven 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.

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 Recommended

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH 603: Discrete Mathematics and Graph Theory

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

The main objective of studying Discrete mathematics and graph theory is to aware the students how to apply laws of set theory, logic and propositional calculus in mathematical analysis. Boolean algebra, named after English mathematician George Boole is a boon to electronic engineers and opens the door 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. Graph theory, the mathematics of network is one of the most important branches of discrete mathematics consisting of vertices and edges and most useful for traveling salesman problems etc. Discrete mathematics is really the poetry of universe.

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.

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.

Recurrence relations: Recursion, Recurrence relation, solving homogeneous recurrence relations with constant coefficients, Characteristic polynomial.

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. Connected and disconnected graphs. Trees and their properties. Binary trees and its properties.

Books Recommended

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.

Khalsa College Amritsar

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Syllabus for

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

BHMH 604: Dynamics

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

Dynamics, branch of physical science and subdivision of mechanics that is concerned with the motion of material objects in relation to the physical factors that affect them: force, mass, momentum, energy. Dynamics has wide applications in science and engineering like in physics , inertial reference frame, free body diagram, Hooke's Law, rotational inertia etc. are extensively used in discussing motion of bodies. In engineering, Hybrid dynamics provide a convenient framework for modeling systems in a wide range of Engineering Applications. The content of this course is designed to make the students understand the concepts of Newton's law of motion, to relate the presence of balanced or unbalanced forces to the state of motion of an object, to analyze and interpret a free-body diagram and determine the acceleration of an object, the effect of mass upon a free-falling object and to calculate the speed and displacement of free-falling objects and concepts of work, power and energy.

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.

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 Recommended:

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.

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Syllabus for

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

BHMH 605: Ring Theory and Linear Algebra

Time: 3 Hours **Max. Marks: 75**

Medium: English **Theory Marks: 56**

Internal Assessment: 19

Objectives and Applications:

The concepts and techniques from linear algebra are of fundamental importance in many scientific disciplines which enable the students to understand the real life applications like in data science. Linear Algebra is an integral branch of mathematics concerning vector spaces and linear mappings between such spaces. The basic goal of the subject is to develop abstract thinking and geometric instinct in the students. 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).

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.

Unit-I

Definition and examples of rings, properties of rings, subrings, integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals. Ring homomorphisms, properties of ring homomorphisms, Isomorphism theorems I, II and III, field of quotients.

Unit-II

Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

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 coordinate matrix.

Books Recommended

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

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-I)
Paper-MHM- 101

REAL ANALYSIS –I

Time: 3Hrs
Medium: English

Max.Marks:100
TheoryMarks:75
Internal Assessment:25

Objectives and Applications:

This course introduce students to the fundamentals of mathematical analysis and reading and writing mathematical proofs. It serves as the basis for measure theory,probability theory which is the foundation for all of statistics (statistical theory deals with convergence of sequences of random variables in high-dimensional Euclidean spaces). Calculus finds its basis in real analysis from finding infinite sums and evaluating limits to understanding the concept of continuity and uniform continuity one is doing real 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, complete spaces, continuity and uniform continuity in a metric space with the understanding of how these notions are generalized from real line to metric spaces.

Instructions for paper setters/examiners:

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.

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, Components, Functions of Bounded Variation.

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Unit-III **80**

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.

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

Books Recommended:

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

Khalsa College Amritsar

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Syllabus for

M.Sc.-Mathematics (Semester-I)

Paper-MHM- 102

ALGEBRA – I

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

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.

Instructions for paper setters/examiners:

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.

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

Unit-III

Solvable groups, Sequences of subgroups, 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 RECOMMENDED:

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 .
7. Nagpaul, S.R. University Press, 1997

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-I)
Paper-MHM- 103
LINEAR ALGEBRA

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

Linear Algebra is an integral branch of mathematics concerning vector spaces and linear mappings between such spaces. The basic goal of the subject is to develop abstract thinking and geometric instinct in the students. Linear Algebra has wide applications in science and engineering. In data science, concepts of transpose and matrix multiplication are used in bivariate analysis in data exploration and regularization of models, SVM (support vector machine) and many more. In Physics, the concepts of vector spaces and their mapping are used in quantum mechanics and theory of relativity. The course will make the students familiar with the concepts of linear independence, basis, span, linear maps, the properties of linear transformations, the characteristic polynomial, eigenvectors, eigenvalues and eigenspaces, diagonalization result, self-adjoint transformations and the spectral theorem and orthogonal decomposition of inner product spaces.

Instructions for paper setters/examiners:

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.

Unit-I

Vector spaces, subspaces, Basis and Dimension Theorems,Quotient spaces, Sum of subspaces, Direct sum decomposition,Linear Transformation, The Algebra of linear transformations, Matrices associated with linear transformations, Effect of change of ordered bases on the matrix of linear transformation, Elementary matrix operations and Elementary matrices, Row rank, Column rank and their equality, Proof of consistency of system of Linear Equations.

Unit-II

Eigen values and Eigen Vectors of Linear Operators, Characteristic and minimal polynomials, companion matrix, subspaces invariant under linear operators, triangulation, Diagonalization, Linear functionals, Dual Spaces and dual basis, the double dual.

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Unit-III

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

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Recommended Book:

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

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-I)
Paper-MHM- 104

NUMBER THEORY

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

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, the concept of continued fractions and Pythagorean triplets and insolvability of Diophantine equations.

Instructions for paper setters/examiners:

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.

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, 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-II

Quadratic residue modulo a prime, Insolvability of Diophantine equation: in positive integers, Euler‟s criterion, The Legendre symbol and its properties, Gauss Lemma, Quadratic reciprocity law, Jacobi‟s symbol and its Properties, Pythagorean triplets.

Unit-III

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

BOOKS RECOMMENDED:

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.

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Syllabus for
M.Sc.-Mathematics (Semester-I)
Paper: MHM- 105 **86**

COMPLEX ANALYSIS

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

Complex analysis, traditionally known as the theory of functions of a complex variable, is the branch of mathematical analysis that investigates functions of complex numbers. 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.

Instructions for paper setters/examiners:

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.

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, Taylor's theorem, Laurent's theorem, Zeros & Singularities of an analytic function, Residue at a pole and at infinity

Unit-III

Cauchy's Residue theorem, Integration round Unit circle. Evaluation of integrals of the form $\int_{-\infty}^{\infty} f(x)dx$ Jordan's lemma, Fundamental theorem of Algebra, Argument principle, Rouche's theorem , Conformal transformations, Bilinear transformations, critical points, fixed points, cross ratio, Problems on cross-ratio and bilinear transformations.

BOOKS RECOMMENDED:

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

Chairperson, BoS in Mathematics

Academic Session **2020-2021**

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-I)
Paper-MHM- 106 **87**

DIFFERENTIAL EQUATIONS

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

The laws of nature are expressed as differential equations. Scientists and engineers must know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions. This course focuses on the equations and techniques most useful in science and engineering. Understanding properties of solutions of differential equations is fundamental to much of contemporary science and engineering. Ordinary differential equations (ODE's) deal with functions of one variable, which can often be thought of as time.

Instructions for paper setters/examiners:

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.

Unit-I

Existence and uniqueness theorem for solution of the equation $\frac{dy}{dx} = f(x, y)$, 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. Sturm Liouville's boundary value problems. Sturm comparison and Separation theorems.

Unit-II

First order PDE's., Integral surface through a given curve. Surface orthogonal to given system of surfaces. Non linear PDE's of first order. Charpit's method and Jacobi's method

Unit-III

PDE's of the 2^{nd} order. Linear PDE's with constant coefficients. Second order PDE's with variable coefficients and their classification. 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 RECOMMENDED:

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

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Khalsa College Amritsar

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Syllabus for **88**

M.Sc.-Mathematics (Semester-II)

Paper-MHM- 201

REAL ANALYSIS -II

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

It is the branch of mathematical analysis that studies the behavior of sequences and series of functions. The Riemann Stieltjes integral which is generalization of the Riemann integral is an invaluable tool in unifying equivalent forms of statistical theorems that apply to discrete and continuous probability. Power series has wide applications in the field of engineering(i.e in spectrum analysis, radio, audio, and light applications). The course objective is to enable students to understand Riemann Stieltjes integrability of a bounded function and prove a selection of theorems concerning integration. Recognize the difference between pointwise and uniform convergence of sequence and series of functions, Equicontinuous families of functions, Arzela Ascoli's theorem and Weierstarss Approximation Theorem and concept of power series, fourier series and gamma function.

Instructions for paper setters/examiners:

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.

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. Integration of vector valued functions, Rectifiable curves.

Unit II

Sequence and Series of functions: Uniform Convergence, Uniform Convergence and continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation, .Equicontinuous families of functions, Arzela's Theorem, Weierstrass Approximation theorem. The Stone-Weierstrass theorem.

Unit III

Power series : Radius of convergence, properties, Abel's Theorem, Taylor's Theorem
Fourier series :Convergence, Riemann Lebesgue Lemma, Bessel's inequality, Parseval's Equality. Gamma function. Linear Transformations (in R^n).

BOOK RECOMMENDED:

1.Walter Rudin: Principles of Mathematical Analysis (3^{rd} 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 2^{nd} Edition Theorem (7.18, 7.30 & 7.31)

Chairperson, BoS in Mathematics

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Khalsa College Amritsar

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Syllabus for

M.Sc.-Mathematics (Semester-II)

Paper-MHM- 202 **89**

ALGEBRA -II

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

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.

Instructions for paper setters/examiners:

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.

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,module of finite length, Torsion module,Torsion free modules, Homomorphism theorems, Direct sums, Finitely generated modules, Simple modules, Cyclic modules, Differences between modules and vector spaces, Structure theorem for finitely generated modules over principal ideal domains, submodules of a finitely generated free module over a P.I.D.

BOOKS RECOMMENDED:

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.

Academic Session **2020-2021**

Khalsa College Amritsar

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

Paper-MHM- 203 **90**

PROBABILITY THEORY

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

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. Course enables important understanding to be gained and informed decisions to be made about a population by examining only a small random sample of the members of that population. Probability theory and statistical distributions are needed to quantify the uncertainty and assess the accuracy of our inference about the population. With this course learner will have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set. Learner can become informed consumer of statistical information provided in newspaper, magazine and journals.

Instructions for paper setters/examiners:

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.
6. Use of Non-programmable Scientific calculator is allowed.

Unit-I

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

Unit-II

Bivariate and multivariate transformation of random variable,Two and higher dimensional random variables and their functions, joint distribution, marginal and conditional distributions, Stochastic independence. Mathematical expectations, moments, moment generating function, probability generating function, Characteristic function, Chebyshev's and Cauchy Schwartz Inequality, Convergence in probability and convergence in distribution, central limit theorem (Laplace theorem Linderberg, Levy's Theorem).

Unit-III

Discrete Distributions: Uniform, Binomial, Poisson, Geometric, Hyper geometric, Multinomial. Continuous Distributions: Uniform, Exponential, Normal distributions, Gamma distribution, Beta distribution, t-distribution, F distribution, Chi-square distribution, sampling distribution of mean and variance of sample from normal distribution.

Books Recommended:

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

Academic Session **2020-2021**

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

M.Sc.-Mathematics (Semester-II)

Paper-MHM- 204 **91**

CLASSICAL MECHANICS AND CALCULUS OF VARIATIONS

Time: 3Hrs **Max.Marks:100**

Theory Marks:75

Internal Assessment:25

Objectives and Applications:

Classical mechanics is the study of the motion of bodies in accordance with the general principles first enunciated by Sir Isaac Newton and calculus of variations is a branch of calculus concerned with maxima and minima of definite integrals. Classical mechanics has many important applications in other areas of science, such as Astronomy (*e.g.*, celestial mechanics), Chemistry (*e.g.*, the dynamics of molecular collisions), Geology (*e.g.*, the propagation of seismic waves, generated by earthquakes through the Earth's crust) and Engineering (*e.g.*, the equilibrium and stability of structures). Calculus of variations is very useful in designing many useful results in Physics and Chemistry like The Fermat's Principles in Optics ,the principle of least action, the law of maximal entropy etc.

Instructions for paper setters/examiners:

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.

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, kinetic energy as a quadratic function of velocities, theory of small oscillations.

Unit-II

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, Variational problems with moving boundaries, Transversality conditions, Orthogonality conditions.

Unit-III

Sturm-Liouville's theorem on extremals, one sided variations, Hamilton's principle, The principle of least action, Langrange's equations from Hamilton's principle. 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 Recommended:

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.

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Academic Session **2020-2021**

Khalsa College Amritsar

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Syllabus for

M.Sc.-Mathematics (Semester-II)

Paper-MHM- 205 **92**

DIFFERENTIAL GEOMETRY

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

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.

Instructions for paper setters/examiners:

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.

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

Unit-II

Tensor Analysis: 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-III

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.

Reference Books:

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

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Academic Session **2020-2021**

Khalsa College Amritsar

(An Autonomous College)

Syllabus for

M.Sc.-Mathematics (Semester-II)

Paper-MHM- 206

MATHEMATICAL METHODS

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

The course is intended to prepare the student with mathematical tools and tecniques that are required in advanced courses offered in the applied mathematics and engineering problems.The concept of Laplace Transformation and Fourier Transformation play a vital role in diverse areas of science and technology such as electric analysis, communication engineering, control engineering, linear system, analysis,statistics, optics, quantum physics, solution of partial differential operation, etc. integral equations are encountered in various problems including radiative transfer, and the oscillation of a string, membrane, or axle.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.

Instructions for paper setters/examiners:

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.

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

Books Recommended:

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

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Khalsa College Amritsar

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Syllabus for **94**

M.Sc.-Mathematics (Semester-III)

Paper-MHM- 301

MEASURE THEORY

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

Measure theory is, in general, a branch of mathematical analysis concerned with determining the sizes of sets. 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.

Instructions for paper setters/examiners:

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.

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 Recommended:

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.

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Syllabus for **95**

M.Sc.-Mathematics (Semester-III)

Paper-MHM- 302

FUNCTIONAL ANALYSIS-I

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

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.

Instructions for paper setters/examiners:

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.

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 RECOMMENDED:

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

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Syllabus for **96**

M.Sc.-Mathematics (Semester-III)

Paper-MHM- 303

STATISTICAL INFERENCE

Time: 3Hrs **Max. Marks: 100**

Medium: English **Theory Marks: 55**

Internal Assessment Theory Marks: 25

Practical Marks: 15

Practical Internal Assessment Marks: 05

Objectives and Applications:

Statistical inference makes propositions about a population, using data drawn from the population with some form of sampling. It is majorly used 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.The content of this course is designed to make the students understand various sampling techniques, use of t, chi, F and z tests to solve problems related to different types of data, the estimation theory, the techniques of testing of hypothesis.

Instructions for paper setters/examiners:

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 five 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.

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 RECOMMENDED:

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.

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Syllabus for

M.Sc.-Mathematics (Semester-III)

Paper-MHM- 304

OPERATIONS RESEARCH-I

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

The central objective of Operational Research-I is optimization i.e. "to do things best under the given circumstances".It helps in to provide quantitative,analytical tools to support decision making particularly the optimization of economic processes, widely used in industries ranging from petro-chemical to airlines,national plans,budget,transport etc., development of the functional mathematical relationship that describe decision variables,objective function,constraints of the problem and non-negativity conditions, for deciding optimum allocation of various limited resources such as men, machines, material, money,time etc to arrive at the optimum decision by using various techniques like assignment, transportation problems, game theory etc.

Instructions for paper setters/examiners:

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.

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 RECOMMENDED:

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

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-III)
Paper-MHM- 305

DISCRETE MATHEMATICS-I

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

The main objective of studying Discrete mathematics is to 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. Grammar is an algebraic system which describes the process by which instances of a language can be constructed. It gives a mathematical structure for accepting or rejecting strings (words) in a language. The beauty of discrete mathematics is that after the completion of the course students will be able to explore and apply the basic method in subsequent courses in the design and analysis algorithms, computability theory and software engineering.

Instructions for paper setters/examiners:

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.

Unit-I

Mathematical Logic: Introduction to Binary relations, equivalence relations and partitions, partial order relations, Hasse diagram. Inclusion and exclusion principle, Pigeonhole principle. Basic logical operations, conditional and biconditional statements, tautologies, contradiction, quantifiers, prepositional calculus.

Unit-II

Grammar and Languages: Phrase structure grammars, derivation sentential forms, language generated by grammar, regular, context free and context sensitive grammar and languages.

Unit-III

Recurrence Relations and Generating Functions: Polynomial expressions, telescopic form, recurrence relations, closed form expression, generating function, solution of recurrence relation using generating function.

BOOKS RECOMMENDED:

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.

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Syllabus for

M.Sc.-Mathematics (Semester-III)

Introduction to Computers and Information Technology

Paper- MHM-306

Medium: English

Time: 3 Hours **Max. Marks: 100**

Theory Marks: 56

Internal Assessment Theory Marks: 19

Practical Marks: 18

Practical Internal Assessment Marks: 07

Instructions for paper setter/examiner:

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**.

UNIT-I

Introduction to Computers and its Applications:

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.
References:

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.

Academic Session **2020-2021**

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-IV)
Paper-MHM- 401

TOPOLOGY

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

Topology is a branch of mathematics concerned with the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending. Toplogy has many applications in various fields. 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 is 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.

Instructions for paper setters/examiners:

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

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

Countability and 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 RECOMMENDED:

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.

Academic Session **2020-2021**

Khalsa College Amritsar

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Syllabus for

M.Sc.-Mathematics (Semester-IV)

Paper-MHM- 402

Functional Analysis II

Time: 3Hrs **Max.Marks:100**

Medium: English **Theory Marks:75**

Internal Assessment:25

Objectives and Applications:

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.

Instructions for paper setters/examiners:

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

Unit -1

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 Recommended:

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.

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-IV)
Paper-MHM- 403

FIELD EXTENTIONS AND GALOIS THEORY

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

Field theory is the theory of the algebraic concepts of field. It plays a principal role in linear algebra. The most important application of field theory is that by describing the geometric situation in terms of algebraic objects, we can give a precise meaning to Euclidean constructions based on compasses and straight edge. The content of this course is designed to make the students understand field as a fundamental algebraic structure, the relationship of different fields, the concept of field extension and splitting field, to test the constructibility of numbers with the help of straight edge and compass, the Galois theory and its applications.

Instructions for paper setters/examiners:

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

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.

Recommended texts:

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.

Khalsa College Amritsar

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Syllabus for
M.Sc.-Mathematics (Semester-IV)
Paper-MHM- 404
OPERATIONS RESEARCH-II

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

Operations Research is the scientific study of operations for the purpose of making better decisions.The intent of OR is to learn about management and administration of socio-cultural behavior and economic factors that exist as bottleneck to effective implementation, to analyse complex real life problems typically with the goal of improving or optimizing performance , to develop more effective approahes to pragramming by using different queuing models,generalized models,power supply model etc., customer's preferance relating to the size,colour packaging and the size of the stock to meet the future demand by applying inventory control methods,replacement problems.

Instructions for paper setters/examiners:

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

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 RECOMMENDED:

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.

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Syllabus for
M.Sc.-Mathematics (Semester-IV)
Paper-MHM- 405

DISCRETE MATHEMATICS-II

Time: 3Hrs **Max.Marks:100**
Medium: English **Theory Marks:75**
Internal Assessment:25

Objectives and Applications:

The main objective of studying Discrete mathematics is to apply laws of set theory, lattices and Boolean algebra in various fields of computer science, electronic engineering and medical sciences. Grammar is an algebraic system which describes the process by which instances of a language can be constructed. It gives a mathematical structure for accepting or rejecting strings (words) in a language. 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.

Instructions for paper setters/examiners:

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.

Unit-I

Lattices and Boolean Algebra: Lattices as partially ordered sets, properties, lattices as algebraic systems, sublattices, direct products, Homomorphism, some special lattices (complete, complemented, distributive lattices). Boolean algebra as lattices, Boolean identities, sub-algebra, Boolean forms and their equivalence, sum of product, product of some canonical forms.

Unit-II

Graph Theory: Definition, undirected graphs, paths, circuits, cycles, subgraphs, induced subgraphs, degree of vertex, connectivity, planner graph, bipartite and complete bipartite graph, matrix representation of graph, adjacency and incidence matrix for graph, Euler's theorem on the existence of Eulerian paths and circuits,

Unit-III

Trees and Colouring of the Graph: Rooted tree, search tree, tree traversals, spanning trees, minimal spanning trees, Kruskal"s algorithm. Chromatic number, four-colour problem, chromatic polynomials.

BOOKS RECOMMENDED:

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

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Syllabus for
M.Sc.-Mathematics (Semester-IV)
Programming in C
Paper- MHM-406

Medium: English

Time: 3 Hours **Max. Marks: 100**

Theory Marks: 56
Internal Assessment Theory Marks: 19
Practical Marks: 18
Practical Internal Assessment Marks: 07

Instructions for paper setter/examiner:
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**.

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.

References:
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.

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Syllabus for

B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–I

MATHEMATICS

M-101

PAPER–I: ALGEBRA

Time: 3 Hours **Max. Marks: 50**

Medium: English **Theory Marks: 38**

Internal Assessment: 12

Objectives and Applications:

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. Students are able to recognize technical terms and appreciate some of the uses of tools of algebra.

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. 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.

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. 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-II

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. 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 Recommended:

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.
4. S.L. Loney: Plane Trigonometry Part–II, Macmillan and Company, London.
5. Shanti Narayan and P.K.Mittal: Text Book of Matrices, S.Chand & Company, Delhi.
6.M.K. Singal and Asha Rani Singal; Algebra, R Chand & Company, Delhi.
7 Rajinder Pal Kaur:Algebra ,First World publication Ludhiana.

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Syllabus for

B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–I

MATHEMATICS

M-102

PAPER–II: CALCULUS AND TRIGONOMETRY

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

Calculus is a branch of mathematics focused on limits, functions, derivatives, integrals, and infinite series. This subject constitutes a major part of contemporary mathematics education. 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. It has been applied in areas such as geodesy, surveying, celestial mechanics, and navigation. It has astoundingly intricate relationships to other branches of mathematics, in particular complex numbers, infinite series, logarithms and calculus.

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. 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.

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, Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms.

Unit-II

De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses. Exponential and Logarithmic function of complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

Books Recommended:

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.

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Syllabus for

B.A. /B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–II

MATHEMATICS

M-201

PAPER–I: CALCULUS AND DIFFERENTIAL EQUATIONS

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 38**

Internal Assessment: 12

Objectives and Applications:

Calculus is a branch of mathematics focused on limits, functions, derivatives, integrals, and infinite series. This subject constitutes a major part of contemporary mathematics education. Calculus has widespread applications in science, economics, and engineering and can solve many problems for which algebra alone is insufficient. A differential equation is a mathematical equation that relates some function with its derivatives. 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.

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. 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.

Unit-I

Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple Points, Curvature, Tracing of Curves (Cartesian and Parametric coordinates only). Integration of hyperbolic functions. Reduction formulae. Definite integrals. Fundamental theorem of integral calculus. Quadrature, rectification.

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 Recommended:

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

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Syllabus for

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SEMESTER–II

MATHEMATICS

M-202

PAPER–II: CALCULUS

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

Calculus II is extension of one variable calculus which is used in various fields such as computer graphics, physical sciences, economics and engineering. It is used in oceanography in calculating the height of tides in oceans. 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.

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. 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.

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 Triple Integrals, Change of variables. Applications to evaluation of Areas, Volumes, Surfaces of solid of revolution, Change of order of integration in double integrals.

Books Recommended:

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.

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Syllabus for

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SEMESTER–III

MATHEMATICS

M-301

PAPER–I: ANALYSIS

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 38**

Internal Assessment: 12

Objectives and Applications:

Analysis is the branch of mathematics that studies the behavior of real numbers, sequences and series of real numbers and real functions. Analysis has important applications in science and engineering in the form of Fourier analysis, wavelets and harmonic analysis. The content of this course is designed to make the students understand to work comfortably with completeness of R, to test the convergence of sequences and series of various types, the convergence of improper integrals, the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

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. 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.

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 Recommended:

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.

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–III

MATHEMATICS

M-302

PAPER–II: ANALYTICAL GEOMETRY

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 37**

Internal Assessment: 13

Objectives and Applications:

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.

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. 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.

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 Recommended:

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.

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–IV

MATHEMATICS

M-401

PAPER–I: STATICS AND VECTOR CALCULUS

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks: 38**

Internal Assessment: 12

Objectives and Applications:

Statics is the study of system of forces in equilibrium and Vector analysis deals with the differentiation and integration of vector functions. Statics is an essential prerequisite for many branches of engineering such as mechanical, aeronautical and bioengineering which address the various consequences of forces. Vector analysis is used extensively in physics and engineering, especially in the description of electromagnetic fields, gravitational fields and fluid flow. The content of this course is designed to make the students understand the resolution and composition of a number of forces, 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 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.

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. 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.

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 Recommended:

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.

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Syllabus for

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SEMESTER–IV

MATHEMATICS

M-402

PAPER–II: SOLID GEOMETRY

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks:37**

Internal Assessment: 13

Objectives and Applications:

Solid geometry is branch of mathematics and is classical name of 3-D Euclidean geometry. It generalises the concepts and ideas of plane geometry. It gives the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure. Its applications being 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.

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. 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.

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 Recommended:

1. Narayan, S. & Mittal, P.K. : Analytical Solid Geometry, S. Chand & Co.
2. Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons.

Khalsa College Amritsar

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

MATHEMATICS

M-501

SEMESTER–V

PAPER–I: DYNAMICS

Medium: English

Max. Marks: 50

Time: 3 Hours **Theory Marks:38**

Internal Assessment: 12

Objectives and Applications:

Dynamics, branch of physical science and subdivision of mechanics that is concerned with the motion of material objects in relation to the physical factors that affect them: force, mass, momentum, energy. Dynamics has wide applications in science and engineering like in physics, inertial reference frame, free body diagram, Hooke's Law, rotational inertia etc. are extensively used in discussing motion of bodies. The content of this course is designed to make the students understand the concepts of Newton's law of motion, to relate the presence of balanced or unbalanced forces to the state of motion of an object, to analyze and interpret a free-body diagram and determine the acceleration of an object, the effect of mass upon a free-falling object and to calculate the speed and displacement of free-falling objects and concepts of work, power and energy.

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. 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.

Section–A

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.

Section–B

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 Recommended:

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.

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

MATHEMATICS

M-502

SEMESTER–V

PAPER–II: NUMBER THEORY

Medium: English

Time: 3 Hours **Max. Marks: 50**

Theory Marks: 37

Internal Assessment: 13

Objectives and Applications:

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.

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. 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

Section–A

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.

Section–B

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.

Books Recommended:

3. D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope inChapters 2-5, 7-12)., 2005

4. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

MATHEMATICS

M-601

SEMESTER–VI

PAPER–I: LINEAR ALGEBRA

Medium: English

Time: 3 Hours **Max. Marks: 50**

Theory Marks: 38

Internal Assessment: 12

Objectives and Applications:

The concepts and techniques from linear algebra are of fundamental importance in many scientific disciplines which enable the students to understand the real life applications like in data science. Linear Algebra is an integral branch of mathematics concerning vector spaces and linear mappings between such spaces. The basic goal of the subject is to develop abstract thinking and geometric instinct in the students.

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. 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

Section–A

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.

Section–B

Linear transformation. Algebra of linear transformation. Rank- Nullity theorem, Isomorphism and Isomorphic spaces, Matrix of a linear transformation. Changes of basis, Linear operator.

Books Recommended:

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.

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Syllabus for

B.A./B.Sc. (Semester System) (12+3 System of Education)

SEMESTER–VI

MATHEMATICS

M-602

PAPER–II: NUMERICAL ANALYSIS

Medium: English

Time: 3 Hours **Max. Marks: 50**

Theory Marks: 37

Internal Assessment: 13.

Objectives and Applications:

Numerical analysis is the study of algorithms that use numerical approximation for the problems of mathematical analysis. 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, to solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.

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. 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.

Section–A

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.

Section–B

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 Recommended:

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.