FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2025

Examinations: 2022-2025

P. G. Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

Index

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2025

Programme Code: BSMH

Programme Name: B.Sc. (Hons.) Mathematics

(Semester I- VI)

Examinations: 2022-2025

Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
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Chairperson, BoS in Mathematics

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

PROGRAMME CODE: BSMH

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

ELIIBILITY:

- Senior Secondary examination (12^{th} grade) with at least 50% marks (45% for SC/ST) in aggregate and wih Mathematics as one of the Elective Subject.
- Any other examination recognized equivalent thereto.

PROGRAMME OBJECTIVES:

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

PROGRAMME SPECIFIC OUTCOMES:

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

Chairperson, BoS in Mathematics

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

Semester-I

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
		Major Core Course Theory and Practical				
1.	BHM- 111	Calculus-I	56	19	75	60
2.	BHM- 112	Algebra-I	56	19	75	60
3.	BHM- 113	Math Lab-I	30	10	40	60
		Minor Course Theory and Practical (Choose any of the following groups)				
		Group-I				
4.	PHX- 111	Physics-I Optics	37	13	50	60
5.	CHX- 111	Organic Chemistry-I	37	13	50	60
6.	PHM-112	Physics Lab-I (Optics Lab)	22	8	30	60
7.	CHM- 112	Organic Chemistry Practical-I	22	8	30	60
		Group-II				
8.	BHM- 114	Statistical Methods-I	45	15	60	60
9,	BHM- 115	Probability theory	45	15	60	60
10.	BHM-116	Practical based on Paper: Statistical Methods-I	30	10	40	45
		Value Addition Course				
11.	ZDA111	DrugAbuse:Problem, Management and Prevention Problem of Drug Abuse (Mandatory Course)	50		50	2Lectures / Week
		Ability Enhancement Compulsory Course				
12.	BCEN- 1123	Communicative English	37	13	50	60
13.	BHPB-**1101** Or	Punjabi Compulsory OR	37	13	50	60
	BPBI-1102	Basic Punjabi	37	13	50	60
Total			334(PHYSICS& CHEMISTRY)/ 336 (STATISTICS)	116(PHYSICS & CHEMISTRY)/ 114 (STATISTICS)	450	540 Hrs. (PHYSICS& CHEMISTRY)/465 HRS (STATISTICS) +2Lect./ Week

* Pass Course

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Semester-II

Sr.No.	Course Code	Course Title	Theory Maximum Marks	Internal Assesment in theory	Total	Hrs.
Major Core Course Theory and Practical						
1.	BHM- 121	Calculus-II	56	19	75	60
2.	BHM- 122	Algebra-II	56	19	75	60
3.	BHM- 123	Math Lab-II	30	10	40	60
Minor Course Theory and Practical (Choose any of the following groups)						
Group-I						
4.	PHX-121	Physics-II (Modern Physics)	37	13	50	60
5.	CHX- 121	Inorganic Chemistry-II	37	13	50	60
6.	PHM-122	Physics Lab-II	22	8	30	60
7.	CHM- 122	Inorganic Chemistry Practical-II	22	8	30	60
Group-II						
8.	BHM- 124	Statistical Methods-II	45	15	60	60
9.	BHM- 125	Probability Distributions	45	15	60	60
10.	BHM-126	Practical based on Papers: Statistical Methods-II and Probability Distributions	30	10	40	45
Value Addition Course						
11.	ZDA 121	**DrugAbuse**:Problem, Management and Prevention Drug Abuse:Management and Prevention (Compulsory ID)	50		50	2Lectures/ Week
Ability Enhancement Compulsory Course						
12.	BCEN- 1223	Communicative English	37	13	50	60
13.	BHPB-1201 or BPBI-1202	Punjabi Compulsory OR Basic Punjabi	37	13	50	60
			37	13	50	60
Total			334(PHYSICS& CHEMISTRY)/ 336 (STATISTICS)	116(PHYSICS& CHEMISTRY)/ 114 (STATISTICS)	450	540Hrs. (PHYSICS& CHEMISTRY)/ 465HRS (STATISTICS)+2Lect./ Week

*Pass Course

Chairperson, BoS in Mathematics

Semester-III

Sr.No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHM-231	Analytical Geometry-I	56	19	75	60
2.	BHM-232	Analysis	56	19	75	60
Generic Elective and Practical (Select any one of the following group)						
Group-I						
3.	PHX-231	Physics-III Electricity and Magnetism	37	13	50	60
4.	CHX- 231	Physical Chemistry-III	37	13	50	60
5.	PHX-232	Physics Lab-III	37	13	50	60
6.	CHX- 232	Physical Chemistry Lab- III	37	13	50	60
Group-II						
7.	BHM-233	Advanced Probability-I	56	19	75	60
8.	BHM-234	Statistical Inference-I	56	19	75	60
9.	BHM-235	Practical Based on Paper:Statistical Inference - I	37	13	50	45
Ability Enhancement Compulsory Course						
10.	CS-BHM-231	Interdisciplinary Course ID-I Programming Language-I	37	13	50	60
11.	ESL221	Environmental studies-I*	50	-	50	2 Lectures /Week
Total			297(PHYSICS& CHEMISTRY) / 298 (STATISTICS)	103 / (PHYSICS& CHEMISTRY)/ 102 (STATISTICS)	400	420Hrs. (PHYSICS& CHEMISTRY)/ 345HRS (STATISTICS)+2Lect./ Week

*Pass Course

Chairperson, BoS in Mathematics

Semester-IV

Sr.No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHM- 241	Mathematical Modelling and Differential Equations	56	19	75	60
2.	BHM-242	Analytical Geometry-II	56	19	75	60
Generic Elective and Practical (Select any one of the following group)						
Group-I						
3.	PHX-241	Physics-IV	37	13	50	60
4.	CHX-241	Molecular Spectroscopy-IV	37	13	50	60
5.	PHX-242	Physics Lab-IV	37	13	50	60
6.	CHX-242	Physical Chemistry Lab- IV	37	13	50	60
Group-II						
7.	BHM-243	Advanced Probability II	56	19	75	60
8.	BHM-244	Statistical Inference - II	56	19	75	60
9.	BHM-245	Practical Based on Statistical inference	37	13	50	45
Ability Enhancement Compulsory Course						
5.	CS-BHM- 241	Interdisciplinary Course ID-II Object Oriented Programming C++	28(Theory) + 10 (Practical)	12	50	60
6.	ESL-222	Environmental studies-II*	50	-	50	2 Lectures/ Week
Total			299(PHYSICS& CHEMISTRY) /298 (STATISTICS)	101(PHYSICS& CHEMISTRY) /102 (STATISTICS)	400	420 Hrs (PHYSICS& CHEMISTRY)/ 345(STATISTICS)

*Pass Course

Chairperson, BoS in Mathematics

Semester-V

Sr.No.	Course Code	Course Title	Maximum Marks	Internal Assessment	Total	Hrs.
1.	BHM- 351	Statics and Vector Calculus	56	19	75	60
2.	BHM-352	Group Theory	56	19	75	60
3.	BHM-353	Number Theory	56	19	75	60
4.	BHM-354	PDE and System of ODE	56	19	75	60
5.	CS-BHM-351	Introduction to Python	28(Theory) + 10(Practical)	12	50	60
6.	BHM-355	Seminar and Assignment	20	5	25	30
Total			282	93	375	330

Semester-VI

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	BHM- 361	Statistical Techniques	52	18	70	60
2.	BHM-362	Numerical Analysis	52	18	70	60
3.	BHM-363	Discrete Mathematics and Graph Theory	52	18	70	60
4.	BHM-364	Dynamics	52	18	70	60
5.	BHM- 365	Linear Algebra	52	18	70	60
6.	BHM- 366	Seminar and Assignment	20	5	25	30
7.	CS-BHM- 361	R Programming	28(Theory) + 10 (Practical)	12	50	60
Total			318	107	425	380

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE: BHM-111

COURSE TITLE:Calculus-I

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs

Time: 3 hrs. **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- 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.
- To understand the concept of hyperbolic functions.
- To make students familiar with the concept of concavity and convexity.

COURSE CONTENTS:

Unit-I

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

Unit II

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

Unit III

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

Unit IV

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

BOOKS PRESCRIBED:

1. Shanti Narayan and P.K. Mittal: Differential Calculus, S. Chand and Co.
2. S.P. Arya : Differential Calculus, Rastogi and Co.
3. S.C. Arora and Ramesh Kumar: A text Book of Calculus ,Pitamber Publication Co.

Chairperson, BoS in Mathematics

4. A.H.Siddiqi,P.Manchanda,M.Brokate,Calculus with Applications: I.K.International Publishing House, New Delhi.

COURSE OUTCOME: After the completion of the course, student will be able to:

- understand the theory and applications of derivatives.
- acquire the knowledge of determining stationary points of functions in order to sketch their graphs.
- make the students understand the concepts of limits and continuity of functions.
- understand the applications of methods of differentiation of functions in predicting the shape of the graph of a function.

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Syllabus for

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

COURSE CODE: BHM-112

COURSE TITLE:Algebra-I

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 Hours

Time: 3 hrs. **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOME: On completing the course, the students will be able to:

- acquire the details of abstractness of mathematics.
- learn matrix algebra, vector spaces, eigen values and eigen vectors and basic concepts of number theory.
- understand the fundamental properties of real numbers that lead to the formal development of Real Analysis.
- recognize technical terms and appreciate some of the uses of tools of algebra.

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE: PHX-111

COURSE TITLE:Physics-I Optics

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60Hours

Time: 3 hrs. **MAXIMUM MARKS: 50**

Medium: English **(THEORY : 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

UNIT-I

1. Interference of Light **15 Hrs**

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 **15 Hrs**

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: **15 Hrs**

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: **15Hrs**

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the students will be able to:**
CO1	Gain knowledge about wave theory of light.
CO2	Acquire an in depth understanding of properties of light like reflection, refraction, interference, diffraction and polarization
CO3	Understand the applications of interference in design and working of interferometers.
CO4	Comprehend the concept of Polarization through thorough understanding of Electromagnetic waves and their transverse nature.
CO5	Understand the applications of diffraction and polarization in various optical instruments.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: CHX-111

COURSE TITLE:Organic Chemistry-I

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 HRS

Time: 3 hrs. **MAXIMUM MARKS: 50**

Medium: English **(THEORY : 37**

INTERNAL ASSESSMENT: 13)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

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

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

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

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

UNIT-I **15Hrs**

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, inversion and retention of configuration, Resolution of enantiomers, chiral centres other than carbon.

UNIT-II **15 Hrs**

Chemistry alkanes and alkenes: Conformations of alkanes and cycloalkanes: conformational analysis of ethane and n-butane; conformational analysis of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivative. Difference between configuration and conformation. Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system, Mechanism of hydrogenation of alkenes, stereochemistry of hydrogenation of alkenes, 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.

UNIT-III 15 Hrs

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, aldol condensation

UNIT-IV 15 Hrs

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 ofbenzene, 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.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

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

Khalsa College, Amritsar

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Syllabus for

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

Semester-I

COURSECODE: BHM-114

COURSE TITLE: PAPER–I: Statistical methods–I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 60

Time: 3 Hours

(Theory Marks: 45

Theory Internal Assessment: 15)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will learn the meaning and scope of Statistics.

COURSE CONTENTS:

Unit-I

Meaning and scope of statistics, Collection of data, presentation of data, diagrammatic representation of data. Attributes and variables, discrete and continuous frequency distribution of a variable, graphical representation of frequency distribution of a variable.

Unit-II

Central tendency: Measures of central tendency, namely, Arithmetic mean, median, mode, Geometric mean, Harmonic mean and their comparisons with an ideal measure of central tendency.

Unit-III

Dispersion and its measures, range, mean deviation, quartile deviation and standard deviation. Advantages of standard deviation as measure of dispersion over the other measures, Relative measures of dispersion, coefficient of variation.

Unit-IV

Central and non–central moments, central–moments expressed in terms of moments about an arbitrary origin and vice-versa. Sheppard's correction for moments. Skewness and its measures, Kurtosis and its measures.

BOOKS PRESCRIBED:-

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.
2. Croxton F.E., Cowden, D.J. and Kelin, S. (1973): Applied General Statistics, Prentice Hall of India.

Chairperson, BoS in Mathematics

3. Goon, A.M. Gupta, M.K. and Dasgupta B.: Fundamentals of Statistics, Vol. I, World Press, 2005.

BOOKS SUGGESTED FOR SUPPLEMENTARY READING:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B.: Basic Statistics, World Press, 2005.
2. Gupta, S.C.: Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to solve Statistical problems using various measure of central tendency.
- collect the data and present it diagrammatically.
- Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
- apply the statistical methods in various fields such as finance, marketing, accounting and business.

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Syllabus for

PROGRAMMEB.Sc. Hons. (Mathematics) SEM-I

Semester-I

COURSE CODE: BHM-115

COURSE TITLE: PAPER–II: Probability theory

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 60

Time: 3 Hours

(Theory Marks: 45

Theory Internal Assessment: 15)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will acquaint themselves with the foundation of probabilistic analysis.
- It will enable the students to quantify the uncertainty and assess the accuracy of our inference about the population.
- Students will have good understanding of exploratory data analysis

COURSE CONTENTS:

Unit-I

Random experiments, sample space, events, mutually exclusive and exhaustive events, algebra of events, various definitions of the probability, axiomatic probability function and its properties.

Unit-II

Finite sample spaces; equally likely outcomes, additive law of probability, conditional probability, multiplicative law of probability, independent events. Baye's Theorem and its applications.

Unit-III

Random variable, examples of random variables, Discrete and continuous random variables, probability mass function and density function, cumulative distribution function, Properties of distribution function of discrete and continuous random variables. Real valued functions of one dimensional random variables and the procedures of finding the Probability Distributionsfunctions of such functions illustrated by examples.

Unit-IV

Expected value of a random variable and of functions of one dimensional random variable. Properties of expected values. variance of random variable and its properties. Moment generating function and its properties.

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).

Chairperson, BoS in Mathematics

2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007
3. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use statistics in engineering and science like disease modeling, climate prediction networks etc.
- to quantify the uncertainty and assess the accuracy of our inference about the population.
- have good understanding of exploratory data analysis.
- learn the concept of random variable, expected value and moment generating function of random variable.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-I
COURSE CODE: BCEN-1123
COURSE TITLE:Communicative English

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

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)**

COURSE OBJECTIVES:

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

COURSE 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, Third Edition. They will be required to answer the questions given after each essay.

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

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

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.

Chairperson, BoS in Mathematics

COURSE OUTCOMES: On completing the course, the students will be able to:

- Students become effective communicators in English language and get better employment opportunities at global level.
- It enhance their confidence level and develops their overall personality.
- The students become familiar with socio-political and cultural isuses through the recommended text.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER-I

COURSE CODE: BHPB-1101

COURSE TITLE:ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

ਸਮਾਂ : 3 ਘੰਟੇ

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫਤਾ : 04
ਕੁੱਲ ਘੰਟੇ : 60
ਕੁੱਲ ਅੰਕ : 50
ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। 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। 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। 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 ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 37+13 = 50 ਹਨ।

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ COURSE OBJECTIVE

- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ।
- ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਵਿਕਸਤ ਕਰਨਾ।
- ਮਾਤ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਪਹਿਲਾ - ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ, ਡਾ. ਆਤਮ ਰੰਧਾਵਾ ਅਤੇ ਡਾ. ਪਰਮਿੰਦਰ ਸਿੰਘ (ਸਹਿ ਸੰਪਾ.)
(ਕਵਿਤਾ ਭਾਗ ਵਿਚੋਂ ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ/ਕਵਿਤਾ ਦਾ ਵਿਸ਼ਾ-ਵਸਤੂ। ਕਹਾਣੀ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)

ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ
ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
(ਨਿਬੰਧ 1 ਤੋਂ 6 ਤਕ ਸਾਰ/ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸ਼ੈਲੀ)

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

Chairperson, BoS in Mathematics

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ COURSE OUTCOMES (COS)

- ਵਿਦਿਆਰਥੀ ਦੀ ਸਾਹਿਤਕ ਸੋਚ-ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
- ਉਸ ਵਿਚ ਸਾਹਿਤ ਰੁਚੀਆਂ ਵਿਕਸਤ ਹੋਣਗੀਆਂ।
- ਉਸ ਵਿਚ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ।
- ਉਹ ਕਿਸੇ ਵੀ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦੇ ਕਾਬਲ ਹੋਵੇਗਾ।
- ਉਹ ਮਾਤ ਭਾਸ਼ਾ ਦੇ ਵਿਕਾਸ ਵਿਚ ਵਿਸ਼ੇਸ ਯੋਗਦਾਨ ਪਾਉਣਗੇ।

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for

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

SEMESTER-I

COURSE TITLE:ਮੁੱਢਲੀ ਪੰਜਾਬੀ

COURSE CODE: BPBI-1102
(In Lieu of Compulsory Punjabi)

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫਤਾ : 04
ਕੁੱਲ ਘੰਟੇ : 60
ਕੁੱਲ ਅੰਕ : 50
ਥਿਊਰੀ ਅੰਕ : 37

ਸਮਾਂ : 3 ਘੰਟੇ ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- ਭਾਗ ਪਹਿਲਾ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੈ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਅੰਕ ਹਨ। ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹਨ। ਭਾਗ ਚੌਥਾ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨਾ ਹੋਵੇਗਾ।

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

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ COURSE OBJECTIVE

- ਵਿਦਿਆਰਥੀ ਨੂੰ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਪੜ੍ਹਨਾ-ਲਿਖਣਾ ਸਿਖਾਉਣਾ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਆਕਰਨਕ ਬਾਰੀਕੀਆਂ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ।
- ਸ਼ੁੱਧ ਸੰਚਾਰ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।

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

ਪਾਠ–ਕ੍ਰਮ ਨਤੀਜੇ COURSE OUTCOMES (COS)

- ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦੀ ਸਿਖਲਾਈ ਵਿਚ ਮੁਹਾਰਤ ਹਾਸਿਲ ਕਰਨਗੇ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਚ ਮੁਹਾਰਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂ, ਸਵਰ ਅਤੇ ਵਿਅੰਜਨ ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਦੁਆਰਾ ਉਨ੍ਹਾਂ ਦੀ ਸਮਝ ਨੂੰ ਵਿਕਸਿਤ ਹੋਵੇਗੀ।
- ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜਾਂ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰਕੇ ਉਹ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਲਿਖਣ-ਪੜ੍ਹਨ ਦੇ ਸਮਰੱਥ ਹੋਣਗੇ।
- ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨ ਪ੍ਰਬੰਧ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰਨਗੇ।

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: PHM-112
COURSE TITLE: Physics Lab-I (Optics Lab)

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS: 60
Time: 3 hours **MAXIMUM MARKS:30**
(Practical Marks: 22+Internal Assessment: 08)
Pass Marks: 35%

General Guidelines for Practical Examination

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

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.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED :

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

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

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the students will be able to:**
CO1	Understand the working of basic optical instruments.
CO2	Understand and differentiate between the different phenomenon related to light such as Interference, diffraction and polarization.
CO3	Gain precision in handling of optical instruments.
CO4	Understand the operating principle of certain optical instruments
CO5	Understand the applications of Interference, diffraction and polarization.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: CHM-112
COURSE TITLE:Organic Chemistry Practical-I

Labs 3 Hrs/week

Credit Hours: 4 Hrs/week
Total Lab Hours: 60
Maximum Marks: 30
Theory: 22
Internal Assessment: 8

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

The preliminary examination of physical and chemical characteristics (physical state, colour, odour and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity
other than acid-base test, preparation of derivatives for given pure organic compounds.

The following categories of compounds should be analyzed.
-phenols, carboxylic acids
-carbonyl compounds - ketones, aldehydes
-carbohydrates
-aromatic amines
-aromatic hydrocarbons

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

COURSE OUTCOMES:

S. No.	On completing the course, the outcomes
CO1	Performed functional group analysis
CO2	Preparation of derivatives of organic compounds
CO3	Determination of physical constant: Melting point, Boiling point.
CO4	Different separation techniques.
CO5	How to perform TLC

Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics)
Semester-I
COURSE CODE: BHM-116

COURSE TITLE: Practical based on PAPER: STATISTICAL METHODS–I

CREDIT HOURS (PER WEEK): 3
TOTAL HOURS: 45 hrs.

Time: 2 Hours **MAXIMUM MARKS: 40**
(Practical Marks: 30
Internal Assesment Practical: 10)

INSTRUCTION FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and another one is external). This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will solve problems related to measure of dispersion.

COURSE CONTENT:

Teaching time for practical paper would be two period per week.

List of practical exercises:

1. Exercises on presentation of Data
2. Exercises on measurers of central tendency
3. Exercises on measures of dispersion
4. Exercises on calculation of moments
5. Exercises on measures of Skewness
6. Exercises on measures of Kurtosis

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to solve Statistical problems using various measure of central tendency.
- collect the data and present it diagrammatically.
- Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
- apply the statistical methods in various fields such as finance, marketing, accounting and business.

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Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: BHM-113
COURSE TITLE:Math Lab-I

CREDIT HOURS(PER WEEK): 4
TOTAL LAB HOURS: 60 HRS
MAXIMUM MARKS: 40
(Theory: 30
Internal Assessment: 10)

COURSE OBJECTIVES:

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

COURSE CONTENT:

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

(a) Operations on matrices using Matlab:
1. Addition of matrices
2. Subtraction of matrices
3. Multiplication of matrices
4. Inverse of matrices
5. Determinants of matrices
6. Eigen values and Eigen vectors of matrices
7. Rank of matrices

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

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

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:On completing the course, the students will be able to:

- develop a basic understanding of MATLAB for its usage in higher learning.
- have a precise direction from theoretical learning to computational techniques.
- solve mathematical concepts and sketching of graphs in fraction of seconds.
- convert the theoretical concepts in matrices to algorithms in MATLAB for their applications in real life.

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Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-I
COURSE CODE: ZDA-111
COURSE TITLE- Drug Abuse: Problem, Management and Prevention
PROBLEM OF DRUG ABUSE
(Compulsory for all Under Graduate Classes)

CREDIT HOURS (PER WEEK): 1.5
TOTAL HOURS: 22.5 HRS.

Time: 3 hrs.
Medium: English

MAX. MARKS: 50

INSTRUCTIONS FOR THE PAPER SETTERS:

Section–A: (30 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: (30 Marks) It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

COURSE OBJECTIVES:

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

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 and 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.

BOOKS PRESCRIBED:

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, “voZrI d[otos'A^(BPky'oh) ;wZf;nk, gqpzXB ns/ o'eEkw”, 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, “voZrI d[otos'A^(BPky'oh) gqpzXB ns/ o'eEkw”, 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.
30. 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.

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COURSE OUTCOMES: The students will be able:

- To describe issues of cultural identity, ethnic background, age and gender in prevention, treatment and recovery.
- To describe warning sign, symptoms, and the course of substance use disorders.
- To describe principles and philosophy of prevention, treatment and recovery.
- To describe current and evidenced-based approaches practiced in the field of addictions.

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE: BHM-121

COURSE TITLE: Calculus-II

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs

Time: 3hrs. **MAXIMUM MARKS: 75**

Medium: English **(Theory: 56**

Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSEOBJECTIVES:

- This course introduces the concept of integration of hyperbolic functions.
- Students will evaluate double and triple integrals of functions of several variables.
- Students will apply double and triple integrals in evaluating area and volume of solids.
- To aquaint with the concepts of jacobians, maxima and minima of functions of two variables, envelopes and evolutes.

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

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

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COURSE OUTCOMES:

On completing the course, the students will be able to:

- understand the concept of theory and applications of integrals.
- finding the area of a region, volume of solids with known cross section, centre of gravity, mass and momentum of bodies.
- get familiar with the properties and geometric interpretation of definite integrals.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHM- 122
COURSE TITLE: Algebra-II

CREDIT HOURS(PER WEEK): 4
TOTAL HOURS: 60 hrs
Time: 3hrs. **MAXIMUM MARKS: 75**
Medium: English **(Theory: 56**
Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED

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

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COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the abstract ideas and they can easily learn matrix algebra, vector spaces, eigen values and eigen vectors.
- recognize consistency and inconsistency of linear equations.

- understand the fundamental properties of real numbers that lead to the formal development of Real Analysis.
- apply the abstractness of Algebra that will help the brain to think in totally new pattern.

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE: PHX-121

COURSE TITLE: Physics-II (Modern Physics)

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS : 60 HOURS
MAXIMUM MARKS: 50

Time: 3hrs. **(THEORY: 37**
Medium: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

UNIT-I **15 Hrs**

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 **15 Hrs**

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 **15 Hrs**

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

UNIT-IV **15 Hrs**

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.

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the student will be able to:**
CO1	Attain a comprehensive knowledge and understanding of the main Physical concepts and theories of the 20th century.
CO2	Understand the basic ideas of Quantum Physics through concepts of Blackbody radiation, Photoelectric effect, Compton effect, uncertaintyprinciple and concept of wave packet.
CO3	Understand the basics of crystallography and X-ray diffraction.
CO4	Gain an in depth understanding about the process of Radioactivity and its biological effects and Applications.
CO5	Understand the concepts related to particle Physics and will attain knowledge about the classification and properties of different particles.

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE:CHX-121
COURSE TITLE: INORGANIC CHEMISTRY-II

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

Time: 3hrs.
Medium: English

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

UNIT-I **15 Hrs**

Co-ordination Chemistry: Introduction, Werner's coordination theory, naming of co-ordinate complexes. Co-ordination numbers 1-12 and their stereo-chemistries. Factors affecting co-ordination numbers and stereo-chemistry

(a) Configurational Isomers

(b) Conformational isomerism,

Bonding in metal complexes: Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory.

UNIT-II **15 Hrs**

Crystal field theory: Splitting of d-orbitals in octahedral, tetrahedral. Pairing Energy, 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 and Hydration energies.

UNIT-III **15 Hrs**

Electronic spectra, Beer Lambert Law, Angular Momentum of electron spectra, Total angular momentum, Microstates and spectroscopic terms, a calculation of spectroscopic terms ford' 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-IV **15 Hrs**

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.

.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

Sr. No.	On completing the course,
CO1	Students learned about the coordination compounds, theory, their nature of bonding,
CO2	Students gained knowledge to apply ligand field theory CFT on simple molecules.
CO3	able to learned about Molecular orbital theory
CO4	Learned about VSEPR theory, VBT
CO5	HSAB principle, Orgel Diagram, Macrocyclic ligands

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics)
Semester-II
COURSE CODE: BHM-124
COURSE TITLE: STATISTICAL METHODS – II

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

Medium: English

MAXIMUM MARKS: 60

Time: 3 Hours **(Theory Marks: 45**
Theory Internal Assessment: 15)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students wil understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will use Method of association and contingency table to find the independence of the attributes.

COURSE CONTENT:

UNIT-I

Bivariate data, scatter diagram, covariance, Karl–Pearson's correlation coefficient and its properties, calculation of correlation coefficient from grouped data, bounds of the correlation coefficient, interpretation of the value of the correlation coefficient.

UNIT-II

Spearman’s rank correlation coefficient, The principle of least squares, fitting of straight line, polynomials, exponential, logarithmic curve.

UNIT-III

Regression lines, relation between correlation coefficient and regression coefficients.

UNIT-IV

Independence and association of attributes, measures of association,contingency table.

BOOKS PRESCRIBED:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Basic Statistics, World Press, 2005.
2. Gupta, S.C., Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to establish linear association between two variables by using Correlation.
- find the best fit for a set of data points with the help of method of least square.
- use regression to predict the behavior of dependent variable.
- Use Method of association and contingency table to find the independence of the attributes.
- use statistical methods in the future prediction for various observations in different fields like Business Analysis, Artificial Intelligence, Financial Analysis, Fraud Detection, Share Market and Pharmaceutical Sector and other industries.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHM-125

COURSE TITLE: Probability Distributions

CREDIT HOURS (PER WEEK):4
TOTAL HOURS: 60 hrs
Medium: English **MAXIMUM MARKS: 60**
Time: 3 Hours **(Theory Marks: 45**
Theory Internal Assessment: 15)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will apply the Probability Distributionsin real life situations such as Business Analysis, Artificial Intelligence, Financial Analysis, Fraud Detection etc.
- Students will realize difference between discrete and continuous distributions.
- Students will know about distributions to study the behavior of two random variables

COURSE CONTENT:

Unit–I

Discrete Distributions: Uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, Poisson distribution as limiting form of Binomial distribution, Fittings of Binomial and Poisson distributions,

Unit–II

Geometric distribution, Pascal distribution and Hyper geometric distribution. Properties, expected value, variance and moment generating functions of these distributions.

Unit–III

Continuous Distributions: Normal distribution, Fitting of normal distribution, Exponential distribution, Uniform distribution.

Unit–IV

Gamma distribution, Beta distribution. The properties of these distribution including their expected values, variances and moment generating functions

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.
3. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- to differentiate discrete and continuous distributions.
- know about distributions to study the behavior of two random variables.
- study the discrete distributions such as Bernoulii, Binomial, Poisson etc.
- Learn about Continuous distributions such as Exponential, Normal, uniform etc. will be studied in this course.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. (Hons.) Maths/ Phy./Chem. SEM-II
COURSE CODE: BCEN-1223
COURSE TITLE: COMMUNICATIVE ENGLISH

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS : 60 HOURS
MAXIMUM MARKS: 50
(THEORY: 37

Time: 3hrs.

INTERNAL ASSESSMENT: 13)

Medium: English

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)**

COURSE OBJECTIVES:

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

COURSE 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, Third Edition. They will be required to answer the questions given after each essay.

2. Developing Vocabulary and using it in the right context :

Students will be required to study "prefix" and "suffix" from the chapter "vocabulary" in the book *The Written Word.* The question will be set from the following words :
Prefixes :- a-, anti-, auto-, bi-, dia-, di-, dis-, homo-, Hyper-, hypo-, mis-, non-, semi-, un-, pre-

Suffixes :- -able, -al, -cy, -dom, -fy, -hood, -ious, -ist, -ment, -ness, -ship, -some, -y, -logy.

3. Writing Skills

Students will be required to learn Essay writing, Report Writing and Letter Writing as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Students become effective communicators in English language and get better employment opportunities at global level.
- It enhance their confidence level and develops their overall personality.
- The students become familiar with socio-political and cultural isuses through the recommended text.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER-II

COURSE TITLE: ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

COURSE CODE: BHPB-1201

ਸਮਾਂ : 3 ਘੰਟੇ

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫਤਾ : 04
ਕੁੱਲ ਘੰਟੇ : 60
ਕੁੱਲ ਅੰਕ : 50
ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। 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। 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। 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 ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 37+13 = 50 ਹਨ।

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ।
- ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।
- ਭਾਸ਼ਾਈ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰਨਾ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਦੂਜਾ - ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ, ਡਾ. ਭੁਪਿੰਦਰ ਸਿੰਘ ਅਤੇ ਡਾ. ਕੁਲਦੀਪ ਸਿੰਘ ਢਿੱਲੋਂ (ਸਹਿ ਸੰਪਾ.)
(ਵਾਰਤਕ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਰੇਖਾ-ਚਿੱਤਰ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਦੂਜਾ

ਇਤਿਹਾਸਿਕ ਯਾਦਾਂ
ਸ. ਸ. ਅਮੋਲ (ਸੰਪਾ.), ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
(ਨਿਬੰਧ 7 ਤੋਂ 12 ਤਕ ਸਾਰ/ ਵਿਸ਼ਾ-ਵਸਤੂ/ਸ਼ੈਲੀ)

ਭਾਗ-ਤੀਜਾ

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

ਭਾਗ–ਚੌਥਾ

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

ਪਾਠ–ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀ ਦੀ ਸੋਚ–ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
- ਉਸ ਅੰਦਰ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪ੍ਰਫਲਿੱਤ ਹੋਣਗੀਆਂ।
- ਉਸ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ।
- ਉਹ ਸੰਬੰਧਿਤ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦੇ ਸੁਯੋਗ ਹੋਵੇਗਾ।
- ਉਹ ਭਾਸ਼ਾਈ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ।

Khalsa College, Amritsar

(Autonomous College)

Syllabus for

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

SEMESTER-II

COURSE CODE: BPBI-1202

COURSE TITLE: ਮੁੱਢਲੀ ਪੰਜਾਬੀ

(In Lieu of Compulsory Punjabi)

ਕ੍ਰੈਡਿਟ ਪ੍ਰਤੀ ਹਫਤਾ : 04
ਕੁੱਲ ਘੰਟੇ : 60
ਕੁੱਲ ਅੰਕ : 50
ਥਿਊਰੀ ਅੰਕ : 37

ਸਮਾਂ : 3 ਘੰਟੇ ਇੰਟਰਨਲ
ਅਸੈੱਸਮੈਂਟ : 13

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- ਭਾਗ ਪਹਿਲਾ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੈ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਅੰਕ ਹਨ। ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹਨ। ਭਾਗ ਚੌਥਾ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨਾ ਹੋਵੇਗਾ।
  ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 50 ਹਨ।

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਵਿਕਸਤ ਕਰਨਾ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨਕ ਪ੍ਰਬੰਧ ਸੰਬੰਧੀ ਗਿਆਨ ਕਰਾਉਣਾ।
- ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ ਦੁਆਰਾ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ’ਤੇ ਪਕੜ ਵਧਾਉਣਾ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ :

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

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਪ੍ਰਕਾਰ :

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

ਪਾਠ–ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਬਾਰੇ ਸਮਝ ਹੋਰ ਵਿਕਸਿਤ ਹੋਵੇਗੀ।
- ਉਹ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰਕੇ ਭਾਸ਼ਾਈ ਗਿਆਨ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਗੇ।
- ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ ਸੰਬੰਧੀ ਜਾਣਕਾਰੀ ਉਨ੍ਹਾਂ ਦੇ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰੇਗੀ।

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: PHM-122

COURSE TITLE: Physics Lab-II

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS: 60

Time: 3 Hours **MAXIMUM MARKS:30**

(Practical Marks: 22+Internal Assessment: 08)

Medium: English **Pass Marks: 35%**

GENERAL GUIDELINES FOR PRACTICAL EXAMINATION.

The distribution of marks is as follows: **Max. Marks: 22+08 (Internal Assessment)**

i) One experiment **10 Marks**

ii) Brief Theory **4 Marks**

iii) Viva–Voce **4 Marks**

iv) Record (Practical file) **4 Marks**

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

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

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.

Books Prescribed :

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

Chairperson, BoS in Mathematics

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the student will be able to:**
CO1	Understand the basic experiments of Modern Physics.
CO2	Understand and verify the particle nature of light through experiments on Photoelectric effect.
CO3	Gain knowledge about the construction and working of gas filled radiation detectors.
CO4	Understand the conceptof molecular spectra.
CO5	Learn the working of a PN junction and comprehend the concept of band gap.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE TITLE: Inorganic Chemistry Practical-II

COURSE CODE: CHM-122

CREDIT HOURS(PER WEEK): 4

Time: 3 Hours

Medium: English **TOTAL HOURS: 60 hrs.**

MAXIMUM MARKS: 30

(Theory: 22

Internal Assessment: 8)

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

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

COURSE OBJECTIVE:

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

COURSE CONTENTS:

Section-A

Identification of cations and anions in a mixture which may contain combinations of acid ions.

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.

Section-B

Identification of Cations in Mixtures

Identification of Group I, Group II (Group IIA and IIB), Group III,
Group IV, Group V and Group VI cations.

BOOKS PRESCRIBED:

Vogel's book on Inorganic Qualitative Analysis

Chairperson, BoS in Mathematics

COURSE OUTCOMES:

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

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-II
COURSE CODE: BHM-126
COURSE TITLE: Practical based on Paper Statistical Methods–II And Probability Distributions

CREDIT HOURS (PER WEEK):3
Medium: English **TOTAL HOURS: 45 hrs**
Time: 2 Hours **MAXIMUM MARKS: 40**
(Practical Marks: 30
Internal Assesment Practical: 10)

INSTRUCTION FOR PAPER SETTER:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the principal of the college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

Teaching time for practical paper would be two period per week per paper.

COURSE OBJECTIVES:

- Students wil understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will realize difference between discrete and continuous distributions.

COURSECONTENT:

List of practical exercises

1. Exercises on calculation of Karl Pearsons correlation coefficient
2. Exercises on calculation of Spearman's rank correlation coefficient
3. Exercises on fittings of regression lines, polynomials, exponential and logarithmic curves.
4. Exercises on fittings of Binomial, Poisson and Normal Distributions
5. Exercises on calculation of probabilities for Binomial, Poisson and Normal Distributions

COURSE OUTOCMES: On completing the course, the students will be able to:

- find the best fit for a set of data points with the help of method of least square.
- use regression to predict the behavior of dependent variable
- to differentiate discrete and continuous distributions.
- know about distributions to study the behavior of two random variables.
- study the discrete distributions such as Bernoulii, Binomial, Poisson etc.

Chairperson, BoS in Mathematics

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II
COURSE CODE: BHM-123
COURSE TITLE:Math Lab-II

CREDIT HOURS(PER WEEK):4
TOTAL HOURS: 60 hrs
MAXIMUM MARKS: 40
(Theory: 30+Internal Assesment: **10)**

COURSE OBJECTIVES:

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

COURSE CONTENT:

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

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- develop a basic understanding of MATLAB for its usage in higher learning.
- have a precise direction from theoretical learning to computational techniques.
- use MATLAB in sketching of 3-dimensional graphs in fraction of seconds
- convert the theoretical concepts of integrals to algorithms in MATLAB for their applications in real life.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) SEM-II
Course Code: ZDA121
Course Title-DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
DRUG ABUSE: MANAGEMENT AND PREVENTION
(Compulsory for all Under Graduate Classes)

Credit Hours (per week): 1.5 hrs.
Total Hours: 22.5 hrs.
Max. Marks: 50

Instructions for the Paper Setters:
Section–A: (30 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: (30 Marks) It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

Course Objectives:
The course aim is to

CO-1.	Describe the role of family in the prevention of drug abuse.
CO-2.	Describe the role of school and teachers in the prevention of drug abuse.
CO-3.	Emphasize the role of media and educational and awareness program.
CO-4.	Provide knowhow about various legislation and Acts against drug abuse.

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. voZrI d[otos'A (BPky'oh) gqpzXB ns o'eEkw. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
4. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
5. Randhawa, J.K. and Randhawa, Samreet 2018. Drug Abuse-Management and Prevention. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
6. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
7. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar: Guru Nanak Dev University.
8. Singh, Chandra Paul 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra. 9. World Drug Report 2011, United Nations office of Drug and Crime.
10. World Drug Report 2010, United Nations office of Drug and Crime

Course Outcomes:

The students will be able to:

CO-1.	Understand the importance of family and its role in drug abuse prevention.
CO-2.	Understand the role of support system especially in schools and inter-relationships between students, parents and teachers.
CO-3.	Understand impact of media on substance abuse prevention.
CO-4.	Understand the role of awareness drives, campaigns etc. in drug abuse management.
CO-5	Learn about the Legislations and Acts governing drug trafficking and Abuse in India.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: BHM-231

COURSE TITLE:Analytical Geometry-I

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 Hours

Time: 3 hrs. **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- It will help the students to understand the concepts of change of origin, rotation of axes and invariants for second degree equations in two dimensions.
- Students will be familiar with the properties of conics (parabola, ellipse, hyperbola).
- Students will comprehend the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions

COURSE CONTENTS:

Unit-I

Transformation of axes in two dimension, Shifting of origin, Rotation of axes, The invariants, Joint equation of pair of straight lines, equations of bisectors.

Unit-II

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-III

Ellipse and hyperbola with their properties. Tangents and normals, Pole and polar. Pair of tangents at a point, Chord of contact.

Unit-IV

Identifications of curves represented by second degree equation in two dimension (including pair of lines). Intersection of three planes, condition for three planes to intersect at a point or along a line or to form a prism.

BOOKS PRESCRIBED:

1. Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry.
2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London.
3. Narayan, S. & Mittal, P.K.: Analytical Solid Geometry, S. Chand & Co.

Chairperson, BoS in Mathematics

4. Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons.
5. Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand and apply the concepts of geometry in the daily life.
- analyse the applications of geometry in different fields such as art, robotics, Computer, and video games.
- realize the important role of Analytical Geometry in architecture and also in the construction of stairs by making use of angles.
- comprehend the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions.
- know about the properties of conics (parabola, ellipse, hyperbola).

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III
COURSE CODE: BHM-232
COURSE TITLE: Analysis

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

Time: 3 hrs.
Medium: English **MAXIMUM MARKS: 75**
(THEORY : 56
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- 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 makethe students understand to work comfortably with completeness of R, to test the convergence of sequences and series of various types
- It will help the students to understand the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

COURSE CONTENTS:

Unit – I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.

Unit –II

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-III

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.

Unit-IV

Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, Beta and gamma functions.

BOOKS PRESCRIBED:

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

Chairperson, BoS in Mathematics

COURSE OUTCOMES: On completing the course, the students will be able to:

- study the behavior of real numbers, sequences and series of real numbers.
- understand how to work comfortably with completeness of R.
- test the convergence of sequences and series of various types, the convergence of improper integrals.
- apply the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: PHX-231 Physics-III

COURSE TITLE: ELECTRICITY AND MAGNETISM

Credit Hours (per week): 4

Total Hours: 60

Time: 3 Hours **Maximum Marks:50**

(Theory 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.**

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

Course Contents:

UNIT-I

Basic Ideas of Vector Calculus, **Line, Surface & volume Intergrals**, Introduction to gradient, divergence & curl; **Curl of Grad, Divergence of curl,** their physical significance, Gauss‟s Divergence and Stoke's theorems (Statement only), Electric charge and its properties, Coulomb‟s law. The electric field due to a point charge and continuous charge distributions **(dipole, Line charge)**, . Field due to electric dipole, Field lines, flux, Gauss‟s law and its applications. Curl of electric field. , Poisson's and Laplace's equations. **Electric Potential, Electric potential as line integral of electric field, Electric Field as negative gradient of potential**, Electric potential due to different charge distribution: Wire, Ring.

UNIT-II

Electric Currents and Fields of Moving Charges Conductors in the electrostatic field, **Concept of Capacitance, capacitance of a Spherical conductor, Parallel plate capacitor with and without dielectric, Reason for increase of capacitance due to a dielectric medium**, 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, **Dielectric strength**, Non Polar and Polar Molecules, Polarisation of Dielectric, Polarization Vector, 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. **Cyclotron**, 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, 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, **Hystersis Curve: Analysis of Magnetisation curve.**

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.

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the students will be able to:**
CO1	Understand the calculus along with physical principles to effectively solve problems encountered in everyday life and further study in science.
CO2	Learn about electric charges and their interactions, electric field, electric potential, Coulomb’s law, Gauss’s law and their applications.
CO3	Explain the concept of moving charges, current, capacitors and their energy storage, Ohm’s law and polarizability.
CO4	Understand magnetic field due to current and their interactions, Biot-Savart’s law, Ampere circuital law and their applications.
CO5	Understand different types of magnetic materials and Langevin’s theory of diamagnetism and paramagnetism.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE:CHX- 231

COURSE TITLE: Physical Chemistry-III

Medium: English **CREDIT HOURS(PER WEEK): 4**

TOTAL HOURS: 60 Hours

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

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

Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

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 will consist of eight short answer type questions carrying 1½ mark each. Students are required to attempt any six questions.

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

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

UNIT I

1. Solutions and Colligative Properties 15 Hrs.

Ideal and non–ideal solutions, methods of expressing concentrations of solutions, Dilute solution, colligative properties, Raoult's law, relative lowering ofvapour 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. Electrochemistry 15 Hrs.

Electrical transport-conduction in metals and in electrolyte solutions, specific conduction and equivalent conduction, variation of specific and equivalent conduction with dilution, Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte, dissociation, weak and strong electrolytes, Ostwald's dilution law.

UNIT-III

3. Chemical Kinetics 15 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 and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

5. Colloidal State 5 Hrs.

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

S. No.	On completing the course,
CO1	Students will learn about ideal and non–ideal solutions, methods of expressing concentrations of solutions, Dilute solution, colligative properties and Raoult's law
CO2	Students will be able to understand rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions
CO3	Students will learn about homogeneous catalysis, autocatalysis, oscillation reactions.Enzyme catalysis and heterogeneous catalysis
CO4	Students will be able to understand the structure of liquids Structural differences between solids, liquids and gases. Liquid crystals
CO5	Students will understand the classification of colloids. kinetic, optical andelectrical, properties, stability of colloids,protective action, Hardy Schulze law, gold number, Types of emulsions, Emulsifiers and applications of colloids.

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

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

SEMESTER–III

COURSE CODE: -BHM-233

COURSE TITLE: PAPER–I: Advanced probability-I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 75**

Time: 3 Hours **(Theory Marks: 56**

Theory Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will study the moments of bivariate probability distributions
- Students will learn about distributions to study the joint behavior of two random variables.
- Students will learn to compute expectation, covariance and correlation coefficients.
- It will enable the students to have good understanding of exploratory data analysis.

COURSE CONTENT:

Unit–I

Two dimensional random variables, their joint probability mass function and joint probability density function, marginal and conditional Probability Distributionsfunctions, Independent random variables.

Unit–II

Expected value of real valued function of two-dimensional random variables, variance of a linear combination of random variables, Moments of Bivariate Probability distributions, Bivariate moment generating function.

Unit–III

Conditional expectation and conditional variance, Covariance, correlation coefficient. Cauchy Schwartz Inequality and its applications

Unit–IV

Bivariate normal distribution, marginal and conditional probability distributions associated with the bivariate normal distribution. Chebyshev's inequality and its applications.

BOOKS PRESCRIBED:

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).

Chairperson, BoS in Mathematics

2. Ross, S.A., First Course in Probability, Pearson Education, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.
3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Study the moments of Bivariate probability distributions
- learn about distributions to study the joint behavior of two random variables.
- Learn to compute expectation, covariance and correlation coefficients
- Learn the applications of Cauchy Schwartz Inequality and Chebyshev’s inequality

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

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

SEMESTER–III

COURSE CODE: BHM-234

COURSE TITLE: PAPER–II: Statistical inference–I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 75**

Time: 3 Hours **(Theory Marks: 56**

Theory Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- To enable the students to develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- To help the students to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

COURSE CONTENT:

Unit–I

Point estimation, estimator and estimates, criteria for good estimators, unbiasedness, consistency, efficiency and sufficiency (only the definitions and examples).

Unit–II

Minimum variance unbiased estimator, Methods of estimation: moments and maximum likelihood method of estimation.

Unit–III

Interval estimation. Interval estimate of the mean of a normal distribution, Neyman and Pearson's theory of testing hypothesis, the concepts of statistical hypothesis, two types of errors, critical region, significance level.

Unit-IV

Power and power function, Most powerful test, The Neyman Pearson theorem (only the statement) and its applications for testing a simple hypothesis against a simple alternative.

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol.I & II, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

Chairperson, BoS in Mathematics

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand Different methods of finding point estimators for unknown population parameters, their advantages and disadvantages .
- Learn Desirable properties of point estimators based on which estimators can be compared.
- Apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- Develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- Learn to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

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

COURSE CODE:ESL221

COURSE TITLE: ENVIRONMENTAL STUDIES–I (COMPULSORY)

Time: 3 Hrs. **CREDIT HOURS (PER WEEK): 2**

TOTAL HOURS: 30

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

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

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

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

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

Course Objectives:

CO-1	The main goal of Environmental studies is to create the environmental awareness to create a safe, green and sustainable environment.
CO-2	To make students aware about the importance of ecosystem, types of ecosystem, energy flow in an ecosystem, ecological succession, food chain and food web.
CO-3	To make students aware of water conservation, global warming, consumerism and waste products. and, also about the environmental protection acts.
CO-4	Role of National Service Scheme (NSS). Health and hygiene.

Unit-I

The Multidisciplinary Nature of Environmental Studies: Definition, components, scope and importance of environment/environmental studies, Need for public awareness.

Natural Resources: Definition, types, use, overexploitation, benefits, case studies (if any) and associated problems of following natural resources: Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Recourses *etc.*

Roleof an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit-II

Ecosystem:

General introduction, types (Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems *viz.* ponds, streams, lakes, rivers, oceans, estuaries),Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Unit-III

Social Issues and Environment: Sustainable development,Urban problems related to energy, Water conservation, rain water harvesting.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 andholocause. Case studies.Wasteland reclamation.

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 ofNSS; 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.

Suggested Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2013 . Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. and 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. and Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age

International (P) Ltd, New Delhi.
7. Mahapatra, R., Jeevan, S.S. and Das, S. 2017. Environment Reader for Universities, Centre for Science and Environment, New Delhi.
8. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
9. Raven, P.H., Hassenzahl, D.M. and Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
10. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
11. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
12. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.
13. Saroj A., Kaur R., Walia H., Kaur T, 2021. Environmental Studies - A Holistic Approach, KLS Publishers.

Suggested Websites:

1. https://nss.gov.in
2. https://moef.gov.in
3. http://punenvis.nic.in
4. https://www.unep.org

Course Outcomes:

CO-1	To learn about the sustainable environment.
CO-2	To gain the knowledge ecosystem and its functioning.
CO-3	To know about the water conservation programs like rain water harvesting and water shedding and to gain knowledge of environmental (air, water and pollution) protections acts.
CO-4	To know about the role and importance of NSS– a volunteer organization, in making up a better environment and to maintain better health and hygiene.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-III
COURSE TITLE: Programming Language-I
COURSE CODE: CS-BHM-231

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

Time: 3 Hours **MAXIMUM Marks: 50**
(Theory Marks: 28
Practical Marks:10
Internal Assessment: 12)

Note: 1. Medium of Examination is English Language.
2. The question paper covering the entire course shall be divided into three sections.

- **Section A**: It will have questions no. 1 consisting of 10 very short answer questions from the entire syllabus. Students will attempt 6 questions. Each question will carry 1 mark with answer to each question up to 10 lines in length. Total weightage being **06 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 **5.5 marks.**
- The total weightage of this section shall be **11 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 **5.5 marks**.

The total weightage of this section shall be **11 marks**.

COURSE OBJECTIVES :

- The course is designed to provide complete knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- Also, by learning the basic programming constructs they can easily switch over to any other language in future.

COURSE CONTENT:

Unit–I

Introduction to Computer Programming, Program Development life cycle, algorithms, flow chart, decision table & pseudo code.
Introduction to C language, data types, Operators and Expression, Input/output Functions, Structured programming elements, Control statements: Branching, Jumping, Looping Arrays.

Unit–II

Pointers, Functions: Inbuilt Functions, User defined Functions, Recursion, Storage Classes in C, dynamic memory management.
Strings, Structure and union, Reference variables, basics of searching and sorting techniques, File handling in C

BOOKS PRESCRIBED:

1. R.S. Salaria: Applications Programming in C, Khanna Book Publishing Co. (P) Ltd., Delhi.
2. Byron Gotterfied: Programming in C, Tata McGraw Hill Publishing Company Ltd., Delhi.
3. Yashvant Kanetkar: Let Us C, BPB Publications, Delhi.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Use the fundamentals of C programming in trivial problem solving
- Identify solution to a problem and apply control structures and user defined functions for solving the problem
- Demonstrate the use of Strings and string handling functions
- Ability to work with arrays of complex objects.
- Apply skill of identifying appropriate programming constructs for problem solving. B.Sc. (Hons.) Mathematics

B.Sc. (Hons.) Mathematics
Semester-III
Programming Laboratory – I

Development of Computer Programs using C language for: Separation of odd and even numbers, Summation of N Natural numbers; Generating Fibonacci series, Roots of quadratic and Cubic equations; Evaluating various mathematical functions: exp(x), log(x), sin(x), cos(x) etc using Taylor series expansion; Arranging numbers in ascending and descending orders; finding maximum/minimum of numbers, for matrix operations; determinants, 3×3 inverse of matrix, elementary numerical methods and statistical methods.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

Sem-III

COURSE CODE: PHX-232

COURSE TITLE: Physics Lab-III

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS: 60

TIME: 3 HOURS **MAXIMUM MARKS:50**

(Practical Marks: 37+Internal Assessment: 13)

Pass Marks: 35%

I. The distribution of marks is as follows: **Max. Marks: 37+13(Internal Assessment)**
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.
Course Objectives: The objective of the course is to provide knowledge of various practical's about electricity and magnetism and measurements such as Resistance, Voltage, current etc. The course provides practical knowledge of various physical phenomena such as magnetism, electromagnetism and semiconductors. Students would gain a hands-on learning experience by performing experiments on these properties of materials. The students can understand the principles to effectively solve problems encountered in everyday life and further study in science.

Course Contents:

1. To determine low resistance with Carey-Foster's Bridge after calibrating the bridge wire.
2. To determine low resistance with Carey-Foster's Bridge without calibrating the bridge wire.
3. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
4. To study the induced e.m.f. as a function of the velocity of the magnet.
5. To determine unknown Capacitance by flashing and quenching of a neon lamp.
6. Determination of permittivity of a air and relative permittivity by measuring capacitance using de–Sauty's bridge.
7. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.

8. To study the working of household energy meter.

9. To determine the heating efficiency of an electric kettle with varying input voltages.

10. To study the resonance in series LCR circuit for different R values and calculate Q value.

11. To determine the magnetic dipole moment of a bar magnet and horizontal intensity of earth's magnetic field using a deflection magnetometer.

12. To measure the charge sensitivity of a moving coil Ballistic galvanometer using a known capacitor.

13. To measure the magnitude and direction of earth's magnetic field using earth inductor.

14. To study the variation of resistance of a filament of a bulb with temperature.

BOOKS PRESCRIBED :

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

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

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the students will be able to:**
CO1	Understand and perform the practical of Carey Foster bridge to find low resistance with and without calibrating it.
CO2	Understand the working of household energy meter.
CO3	Verify the faraday's law of electromagnetic induction by simple experiment.
CO4	Find the efficiency of an electric kettle with varying input voltages.
CO5	Find the unknown capacitance by using flashing and quenching method. Variation of magnetic field with distance can also be studied.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons) Maths Semester-III

COURSE TITLE: Physical Chemistry Lab-III

COURSE CODE: CHX-232

CREDIT HOURS(PER WEEK): 4 HRS
TOTAL HOURS: 60
MAXIMUM MARKS: 50
(Theory: 37
Internal Assessment: 13)

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

Section-A 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

Section-B Physical Chemistry

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

Viscosity, Surface Tension (Pure Liquids)

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

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

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons) Maths Semester-III

COURSE CODE: BHM-235

COURSETITLE:Practical based on paper Statistical inference–I

CREDIT HOURS (PER WEEK):2

Medium: English **TOTAL HOURS: 45 hrs**

Time: 2 Hours **MAXMIUM MARKS: 50**

(Practical Marks: 37

Internal Assesment Practical: 13)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

The distribution of marks is as under:

1. Practical Note book: 10
2. Viva – voce: 12
3. Exercises: 15

COURSE OBJECTIVES:

- To make the students aware about the practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- To enable the studenst to draw inferences about the unknown population parameters based on random samples.
- To help the students to solve exercises on method of estimators, types of error, critical region , significance level.

COURSE CONTENT:

Teaching time for practical paper would be one hour per week.

List of practical exercises:

1. Exercises on unbiased, consistent, efficient and sufficient estimators
2. Exercises on methods of estimation
3. Exercises on interval estimation
4. Exercises on two types of errors, critical region, significance level,
5. Exercises on Most powerful test,

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- Drawing inference about the unknown population parameters based on random samples
- Validating our estimation/ inference about the population using hypothesis testing.
- Solve exercises on method of estimators, types of error, critical region , significance level.
- Practice the question based on most powerful test.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: BHM-241

COURSE TITLE: Mathematical Modelling and Differential Equations

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 Hours

TIME: 3HRS. **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit – I

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's Form and singular solutions. Geometrical meaning of a differential equation. Orthogonal Trajectories.

Unit – II

Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series method, Frobenius Method.

Unit – III

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).

Unit – IV

Exponential growth of population, limited growth of population, limited growth with harvesting. Epidemic model of influenza and its analysis. Predators and Prey model, Model of battle.

BOOKS PRESCRIBED:

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longman (India), 1967.
2. G.F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. E.A. Codington: An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.
4. B.Barnes & G.R.Fulford: Mathematical modelling with case studies using (Maple & Matlab).
5. Belinda Barnes and Glenn R. Fulford, *Mathematical Modeling with Case Studies, A Differential Equation Approach using Maple and Matlab*, 2nd Ed.,Taylor and Francis group, London and New

York, 2009.
6. S.L. Ross, *Differential Equations,* 3rd Ed., John Wiley and Sons, India, 2004.
7. E. A. Coddington, An introduction to ordinary differential equation, Prentice- Hall of India.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
- Student will be able to find the complete solution of a non-homogeneous differential equation as a linear combination of the complementary function and a particular solution.
- Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.
- Students will learn to formulate differential equations for various mathematical models.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: BHM-242

COURSE TITLE: Analytical Geometry-II

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 HRS

TIME: 3 HRS **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

. **INTERNAL ASSESSMENT: 19)**

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to interfer the concepts and ideas of plane geometry
- This subject will make the students to understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

COURSE CONTENT:

Unit-I

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.

Unit-II

Change of axes in three dimension, Shift of origin, rotation of axes. 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-III

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. Equation of surface of revolution obtained by rotating the curve $f(x,y)=0$ about the z-axis in the form of $f(x^2+y^2,z)=0$.

Unit-IV

Equation of ellipsoid, hyperboloid and paraboloid in standard forms. Surfaces represented by general equation of 2^{nd} degree S = 0. Tangent lines, tangent planes and Normal plane.

BOOKS PRESCRIBED:

1. S.L. Loney: Statics, Macmillan and Company, London.

Chairperson, BoS in Mathematics

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- generalise the concepts and ideas of plane geometry.
- understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

Sem-IV

COURSE CODE: PHX-241

COURSE TITLE:Physics-IV

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS:60 HRS

Time: 3 Hours **MAXIMUM MARKS: 50**

Medium: English **(Theory 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.**

COURSE OBJECTIVES:

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

COURSE CONTENT:

UNIT-I **15 Hrs**

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 planeDiamond and NaCl structures.

UNIT-II **15 Hrs**

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, **Brillouin zone of simple cube, BCC and FCC structure**, Structure factor and atomic form factor.

UNIT-III **15 Hrs**

Crystal Bonding and Lattice vibrations: **Qualitative idea of various types of bonding in solids,** 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, **Difference between Einstein and Debye model of specific heat.**

UNIT-IV **15 Hrs**

Free electron model of metals (Drude Lorentz Classical theory), Sommerfeld quantum theory, Fermi energy, Total and Average energy, Density of states, 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)

COURSE OUTCOMES:

Course Learning Outcomes	**On completing the course, the students will be able to:**
CO1	Differentiate between different lattice types and Miller indices. They can explain NaCl and diamond structure.
CO2	Explain the concepts of reciprocal lattice, Brillouin zones and crystal diffraction..
CO3	Explain the concept of lattice vibrations and effect of the same on electrical and thermal properties of the solids.
CO4	Explain Einstein's and Debye's model of specific heat.
CO5	Explain band structures and their variation with temperature leading to change in material properties. Semiconductor diodes can also be explained.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE: CHX-241

COURSE TITLE: Molecular Spectroscopy-IV

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 HRS

Medium: English **MAXIMUM MARKS:50**

Time: 3 Hours **(Thoery : 37+Internal Assessment: 13)**

Pass Marks: 35%

INSTRUCTIONS FOR PAPER SETTERS AND CANDIDATES:

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 will consist of eight short answer type questions carrying 1½ mark each. Students are required to attempt any six questions.

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

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

UNIT – I

Energy and Electromagnetic Spectrum **15 Hrs**

Introduction, the Electromagnetic Spectrum, Characteristics of Electromagnetic Radiations, Regions of the spectrum, Units of Frequency, Wavelength and Wave number, Interaction of radiation with matter, Absorption and emission spectroscopy, spectroscopic transition between two stationary states, energy levels, Transition probability and Selection Rules, spin-orbit coupling, singlet and triplet states, Fluorescence and Phosphorescence, Statement of Born-Oppenheimer approximation, Degree of freedom, Frank Condon Principle, Basic features of different spectrometers.

UNIT – II

Ultraviolet and Visible Spectroscopy **12 Hrs**

Introduction, Theory (Origin) of UV-Visible Spectroscopy, the energy of electronic excitation, instrumentation, Sample handling, Measurement techniques, Sample and reference cells, Solvents and solutions, Laws of light absorption-Beer's and Lambert's laws, Molar extinction coefficient, Electronic Transitions, Different types of transition noticed in UV spectrum of organic functional groups and their relative energies. Transition Probability: Allowed and Forbidden Transitions, Formation of Absorption Bands, Designation of Absorption Bands, Conjugated Systems and Transition Energies Chromophore, Auxochromes, Absorption and intensity shifts, Factors affecting λmax , Stereochemical Factors in Electronic Spectroscopy, Biphenyls and binaphthyls, Solvent effects, Applications of Electronic Spectroscopy-Conjugated Dienes and a,ß-Unsaturated Carbonyl Compounds.

Applications of UV-visible spectroscopy 3 Hrs

Applications of UV spectroscopy, Woodward Fieser rules for calculating λ_{max} of conjugated polyenes and α,ß -unsaturated carbonyl compounds..

UNIT – III

Infrared Spectroscopy 9 Hrs

Molecular Vibrations, Vibrational energy levels, Selection rules, Modes of vibration, Calculation of vibrational frequencies-degree of freedom, Force constant, Fundamental vibration frequencies, existence of overtones, Factors influencing Vibrational Frequencies (Vibrational Coupling, Hydrogen Bonding, Electronic effect, Bond Angles, Field Effect) of different functional groups. Instrumentation, sampling techniques-solids, liquids.

Applications IR Spectroscopy 6 Hrs

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 – IV

Nuclear Magnetic Resonance 8 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.

Applications of NMR spectroscopy 7 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.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

Sr. No.	On completing the course, the student will be able to
CO1	Understand the spectrums, their types and characteristics.
CO2	Understand the various aspects of UV-Visible spectroscopy and behaviour of UV-peaks and its shifting under different conditions.
CO3	Ssolve the absorption wavelength of conjugated polyenes and α,ß -unsaturated

	carbonyl compounds.
CO4	Interpret the IR spectrum and relate the spectral peaks with the various types of bonds present in the molecules.
CO5	Interpret the actual NMR spectrum and calculate the chemical shift, coupling constant and correlate the NMR peaks with structure and proton counting.

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

SEMESTER–IV

COURSE CODE: BHM-243

COURSE TITLE: PAPER–I: Advanced probability-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 75

Time: 3 Hours **(Theory Marks: 56**

Theory Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to understand the concept of sampling distributions and their applications in statistical inference
- To help the studenst to learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.

COURSE CONTENT:

Unit–I

Concept of statistics, sampling distribution and standard error, Sampling distributions: Chisquare, t and F distributions and their applications.

Unit–II

Sampling distribution of the mean of a set of independent random observations from a normal population, sampling distribution of the sample variance of independent random observations from a normal population (derivation of sample variance distribution is excluded). Expectation and variance of sampling mean and variance.

Unit–III

The law of large numbers, Bernoulli's form of the law of large numbers, Convergence in probability, the difference between convergence in probability and the ordinary convergence of calculus, convergence in distribution.

Unit–IV

The central limit theorem for independent identically distributed random variables and the outline of its proof using moment generating function. Applications of central limit theorem. Normal approximation to the Binomial distribution, Poisson distribution.

BOOKS PRESCRIBED:

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. 2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Ross, S.A., First Course in Probability, Pearson Education, 2007.

Chairperson, BoS in Mathematics

3. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSEOUTCOMES: On completing the course, the students will be able to:

- To understand the concept of sampling distributions and their applications in statistical inference
- Learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.
- Analyze categorical data by using Chi square techniques.
- Understand the laws of convergence and their inter relations

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

SEMESTER–IV

COURSE CODE: BHM-244

COURSE TITLE: PAPER–II: Statistical Inference-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 75

Time: 3 Hours **(Theory Marks: 56**

Theory Internal Assessment: 19)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- To allow the students to compare the two univariate normal distributions through their mean and variance.
- To help the students to apply Z test to check the significance of correlation coefficient, single proportion.
- To help the students to learn the applications of chi square test such as goodness of fit, independence of attributes

COURSE CONTENT:

Unit-I

A Large Sample Tests: Tests about the mean and variance of a univariate normal distribution, comparison of two univariate normal distributions through their means and variances.

Unit-II

Testing the significance of the correlation coefficient. Tests for significance for single proportion and for difference of two proportions, Z-transformation of the sample correlation, tests regarding the population correlation coefficient based on the Z-transformation. Chi-square tests for goodness of fit.

Unit-III

Chi-square test for homogeneity and for independence of attributes, simplified formula for Chi- square for testing homogeneity and for independence in 2x2 tables and kxb contingency tables. Yates correction for continuity in 2x2 tables. Chi-square tests for significance for single variance. F-test for equality of variances.

Unit-IV

Small Sample Tests: t-tests for single population and two populations, paired t-test, t-test for significance of correlation coefficients and regression coefficients,

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. II, World Press, 2005.

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3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTOCMES: On completing the course, the students will be able to:

- have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- Compare the two univariate normal distributions through their mean and variance.
- Apply Z test to check the significance of correlation coefficient, single proportion.
- Learn the applications of chi square test such as goodness of fit, independence of attributes
- Use the t- test for checking the significance of single population and double population.

KHALSA COLLEGE, AMRITSAR

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

SEMESTER–IV

COURSE CODE: BHM-245

COURSE TITLE: Practical based on paper Statistical inference–II

CREDIT HOURS (PER WEEK):2

TOTAL HOURS: 45 hrs

Time: 2 Hours **MAXIMUM MARKS: 50**

(Practical Marks: 37

Internal Assesment Practical: 13)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators

The distribution of marks is as under:

1. Practical Note book: 10
2. Viva – voce: 12
3. Exercises: 15

Teaching time for practical paper would be one hour per week.

COURSE OBJECTIVES:

- To help the students to understand the practical applications of large and small sample tests.
- To draw the inference about the unknown population parameters based on various tests.
- To enable the students to validate the significance of hypothesis using various tests.

COURSE CONTENT:

List of practical exercises

1. Exercises on Large Sample Tests
2. Exercises on Z-transformation
3. Exercises on applications of Chi square test
4. Exercises on applications of t - test
5. Exercises on application of F – test

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of large and small sample tests.
- Drawing inference about the unknown population parameters based on various tests.
- Validate the significance of hypothesis using various tests.
- Solve exercises on Z transformation.
- Practice the question based on application of Chi square test.

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Syllabus for

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

Sem-IV

COURSE CODE: ESL222

COURSE TITLE: ENVIRONMENTAL STUDIES–II (COMPULSORY)

CREDIT HOURS (PER WEEK): 2

TOTAL HOURS: 30 hrs

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

MEDIUM: English/Hindi/Punjabi

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

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

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

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

Course Objectives:

CO-1	To study the concept of Biodiversity – role, importance, values and its conservation. Hot spots and threats to biodiversity.
CO-2	To create awareness regarding environmental pollution, its causes and effects and preventive measure to control the different types of pollution.
CO-3	To make students aware of growing human population – causes and concern. Family welfare programs. Road safety (Traffic) rules.
CO-4	To know about entrepreneurship development and civil/self defense.

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 optionvalues.
- 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. Threatened and endemic species of India.
- Endangered species, vulnerable species, and rare species.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity. National Parks, Wild life sanctuaries, Biosphere reserve, Project Tiger, Project Elephant.

Unit-II

Environmental Pollution:

Environmental Pollution: Concepts and Types

- 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
- Concepts of hazards waste & human health risks.
- Solid Waste Management: Causes, effects and control measures of municipal, biomedical and e-waste
- 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

- Human population growth: impacts on environment.
- Population explosion-Family welfare programme.
- Environment and human health: Concept of health and disease, common communicable and non communicable diseases, public awareness
- Human rights.
- Value education.
- Women and child welfare.
- Role of information technology in environment and human health.
- Environment movments in India: Chipko movement, Silent valley movement and other case studies.
- Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'tswhile Driving, Role of Citizens or Public Participation, Responsibilities of Public underMotor 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.
- Visit to Museum/Science City
- Municipal solid waste management and handling.

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, PearsonEducation (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. Asthana, D.K. 2006. Text Book of Environmental Studies, S. Chand Publishing.
11. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.
12. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India.
13. Mahapatra, R., Jeevan, SS, Das S. 2017. Environment Reader for Universities, Centre for Science and Environment, New Delhi.

Course Outcomes:

CO-1	To know about the meaning of Biodiversity and its role in environment.
CO-2	To know about the causes of different forms of pollution and their control measures.
CO-3	To know about the causes and challenges of growing human population. Women and child welfare programs.
CO-4	To know the development of entrepreneurship and techniques of civil/self defense.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

Sem-IV

COURSE CODE: CS-BHM-241 INTERDISCIPLINARY COURSE ID-II

COURSE TITLE: OBJECT ORIENTED PROGRAMMING C++

TIME: 3 HOURS **CREDIT HOURS (PER WEEK): 4**

TOTAL HOURS:60 HRS

MAXIMUM MARKS: 50

(THEORY MARKS: 28

PRACTICAL MARKS: 10

INTERNAL ASSESSMENT MARKS: 12)

Note: 1. Medium of Examination is English Language.

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

Section A: It will have questions no. 1 consisting of 10 very short answer questions from the entire syllabus. Students will attempt 6 questions. Each question will carry 1 mark with answer to each question up to 10 lines in length. Total weightage being **06 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 **5.5 marks.**

The total weightage of this section shall be **11 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 **5.5 marks**.

The total weightage of this section shall be **11 marks**.

COURSE OBJECTIVES:

The learning objectives of this course are:

1. To understand how C++ improves C with object-oriented features.
2. To learn how to design C++ classes for code reuse.
3. To know how to implement copy constructors and class member functions.
4. To understand the concept of data abstraction and encapsulation.
5. To learn how to overload functions and operators in C++.
6. To learn how containment and inheritance promote code reuse in C++.
7. To know how inheritance and virtual functions implement dynamic binding with polymorphism.
8. To familiarize the students withfile handling concepts in C++.

COURSE CONTENT:

Unit–I

Getting Started: Introduction. A brief history of C++, Variable, Constant, Expression, Statements, Comments and keywords of C++,

Operator: Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Precedence of Operators. Data type, Type conversion, library function.

Input/Output Statements: Inputting using cin and outputting using cout statements, Preprocessor

Directives.
Basic Program construction: A complete C++ program: invoking Turbo C++, naming your program, using the editor, saving your program, compiling and linking, running the program.
Errors: Compiler, linker and runtime.
Other IDE features: Compiling and linking, shortcut exiting from IDE, examining files, opening an existing file, DOS shell.

Decision Making and Looping statement: If statement, if…..else statement, nesting of if statement, switch statement, conditional operator statement. While loop, do loop, for loop, nesting of loops, break and continue statement, go to statement.
Arrays: Defining an array, array type, array elements, Accessing & initializing array, Programming of C++ with array, String handling, array of strings.
Functions: What is a function? Declaring and defining function, Local, global variables, execution of function, Passing argument to function, Return values, Reference arguments, Overloading functions, Inline function and default parameter, Variable and storage classes.

Unit–II

Object Oriented Programming: Objects & Classes, Constructor & Destructor.
Operator Overloading: Overloading unary operators, Overloading binary operators, Data conversion, Pitfalls operator overloading and conversion.
Inheritance: Derived class and Base Class, Derived Class Constructors, Overriding member functions, class hierarchies, Public & Private inheritance, Levels of inheritance.
Polymorphism: Problems with single inheritance, Multiple inheritance.
Structures: A simple structure, specifying the structure, defining a structure variable Accessing Structure member Other structure features, Structure within structure, Structure and classes, Arrays of structure.
Pointers: Addresses and pointers, Pointers and Arrays, Pointers and Functions, Pointers and Strings, Pointer to objects, Pointer to pointers.
Files & Streams: Overview of streams, String I/O, character I/O, Object I/O, I/O with multiple objects, File Pointers, Disk I/O with member functions, Redirections, Error handling, Command– line Argument.

BOOKS PRESCRIBED:

1. C++ & Graphics by Vijay Mukhi's
2. Turbo C++ by Robert Lafore
3. Mastering C++
4. C++ Programming language by Saucham's outline series

COURSE OUTCOMES: *Upon completion of this course, the students will be able to:*

- Understand the difference between the top-down and bottom-up approach.
- Describe the object-oriented programming approach in connection with C++.
- Apply the concepts of object-oriented programming.
- Illustrate the process of data file manipulations using C++.
- Apply virtual and pure virtual function & complex programming situations.

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B.Sc. (Hons.) Mathematics

Semester-IV

Programming Lab-II

Development of Computer Programs using C++ language for: Finding factorial using recursion Generating Fibonacci series using recursion, sorting /searching; finding maximum/minimum of numbers, for matrix operations; determinants, inverse of matrix, solutions of system of linear equations, elementary numerical methods and statistical methods. File handling using pointers. Developing C++ programs using polymorphism and inheritance operator overloading

Khalsa College, Amritsar

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics)

Sem-IV

COURSE CODE: PHX-242

COURSE TITLE: PHYSICS LAB-IV

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS: 60

TIME: 3 HOURS **MAXIMUM MARKS:50**

Medium: English **(PRACTICAL MARKS: 37+INTERNAL ASSESSMENT: 13)**

PASS MARKS: 35%

I. The distribution of marks is as follows: **Max. Marks: 37+13(Internal Assessment)**
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**
II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.
III. Number of candidates in a group for practical examination should not exceed 12.
IV. In a single group no experiment be allotted to more than three examinee in any group.
Course Objectives: The purpose of the course is to understand the concept of energy band gap in semiconductors, working of Zener diode, LED, Germanium and silicon diodes, to understand the variation of resistance of a thermistor with temperature. It includesthe measurement of magnetic parameters from BH curves, working of CRO, dielectric constant of various liquids by working on dipole meter.

Course Contents:

1. Determination of Resistivity and Band Gap of Semiconductors by Four Probe Method at different temperatures.
2. Finding the energy band gap of semiconductor material of a P-N junction of diode.
3. Study of Characteristics of Silicon and Germanium diode.
4. Study of characteristics of Zener diode.
5. Study of characteristics of light emitting diode.
6. To study the stabilization of output voltage of a power supply with Zener diode with variable input voltage and with variable load resistance.
7. To show the variation of resistance of a thermistor with temperature.
8. To trace the B-H curves for different materials using CRO and find the magnetic parameters from these.
9. To determine Hall coefficient by Hall Effect.
10. To determine Stefan's constant using Boltzmann's Law.

To study the dielectric constant of various liquids using dipole meter.

BOOKS PRESCRIBED :

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand the concept of energy band gap in semiconductors.
- Gain the knowledge about working of Zener diode, LED, Germanium and silicon diodes.
- Understand the variation of resistance of a thermistor with temperature.
- Find magnetic parameters from BH curves by working on CRO.
  Easily find out the dielectric constant of various liquids by working on dipole meter.

Khalsa College, Amritsar
(An Autonomous College) Syllabus
for
PROGRAMME: B.Sc. Hons. (Mathematics) Sem-IV
COURSE CODE: CHX-242
COURSE TITLE: Physical Chemistry Lab-IV

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

TIME: 3 HOURS **MAXIMUM MARKS:50**

Medium: English **(PRACTICAL MARKS: 37+INTERNAL ASSESSMENT: 13)**
Pass Marks: 35%

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

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

COURSE CONTENTS:
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 (NaClandHCl).
   c) Precipitation titration of Na_2SO_4 vs. $BaCl_2$.
   d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH.
5. Determination of adsorption isotherm of oxalic acid on charcoal.

BOOKS PRESCRIBED:
1. Advance Practical Chemistry, J. B. Yadav

COURSE OUTCOMES: On completing the course
- Students will learn to measure refractive index of various solvents using refractometer.
- Students will learn to measure angle of rotation with the help of polarimeter and then calculate the optical activity of various solutions.
- Students will learn to calculate the heat of neutrilization, heat of solution of acids, bases and salts with the help of a calorimeter..
- By doing the experiments on conductometer, students will learn measure the cell constant, equivalent conductance, specific conductations and will also perform conductometric titrations.
- By performing the experiment of adsorption ,they will learn about the adsorption isotherm.

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V
COURSE CODE: BHM-351
COURSE TITLE Statics and vector calculus

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

TIME: 3 hours | **MAXIMUM MARKS: 75**
MEDIUM: English | **(THEORY: 56**
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the resolution and composition of a number of forces.
- Students will understand 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.
- Studenst will learn the differentiation and integration of vector functions, properties of gradient, divergence and curl, the applications of Gauss divergence theorem, Stoke's theorem and Green's theorem.

COURSE CONTENT:

Unit-I

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

Unit-II

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-III

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, Vector integration,

Unit-IV

Theorems of Gauss, Green, Stokes and problems based on these.

BOOKS PRESCRIBED:

1. S.L. Loney: Statics, Macmillan and Company, London.

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the study of system of forces in equilibrium and differentiation and integration of vector functions.
- define the resolution and composition of a number of forces, parallel forces and couples, moments of forces and couples about a point and a line.
- generalise the theory behind the friction and centre of gravity.
- apply concept of a vector integration in a plane and in space.

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Syllabus for

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

COURSE CODE: BHM- 352

COURSE TITLE: Group Theory

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs.

Time: 3 hrs **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

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

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COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Group: Definition and examples of groups including permutation groups and quaternion groups, elementary properties of groups, Subgroups and examples of subgroups.

Unit-II

Centralizer, normalizer, center of a group, Normal subgroup, Quotient Group, Properties of cosets, Lagrange's theorem.

Unit-III

Generating set, cyclic groups, commutator subgroups, conjugate elements and class equation of finite groups.

Unit-IV

Group homomorphisms, properties of homomorphisms, Cayley's theorem, properties of isomorphisms, Automorphism, Inner Automorphism.

BOOKS PRESCRIBED:

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

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COURSE OUTCOMES: On completing the course, the students will be able to:

- recognize the mathematical objects that are groups and classify them as abelian, cyclic and permutation groups.
- link the fundamental concepts of groups and symmetrical figures.
- know about group homomorphisms and isomorphisms.
- learn the applications of Lagrange's Theorem.
- know the significance of cosets and normal subgroups.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-V
COURSE CODE: BHM-353
COURSE TITLE: Number Theory

CREDIT HOURS(PER WEEK): 4
TOTAL HOURS: 60 HRS
Time: 3 hrs. **MAXIMUM MARKS: 75**
Medium: English **(THEORY : 56**
INTERNAL ASSESSMENT: 19)

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will study the various properties of numbers.
- Students will learn to solve problems using congruences.
- To study the applicatioms of Fermat and Wilson's theorem.
- To introduce the fast growing and relevant topic of Cryptography as an application of Number Theory

COURSE CONTENT:

Unit-I

Preliminaries: Proof by induction, Binomial Theorem. Divisibility in Integers: Basic Definitions and Properties, The division Algorithm, GCD, The Euclidean Algorithm, LCM, Existence and determination of solution to the linear Diophantine equation ax +by = c, primes-definition & Properties, the fundamental theorem of Airthmetic.

Unit-II

Number-theoretic functions: the greatest integer function, Euler's Phi-function, Sum & number of divisors functions, function & the Inversion formula.

Unit-III

Congrunces-definition and properties, linear congruences, existence & solution of the linear congruence, $ax \equiv b \ mod(m)$, Complete and reduces residue systems, Chinese remainder Theorem.

Unit-IV

Fermat's theorem, Euler's theorem, Pseudoprimes Wilson;s theorem. Application to Cryptpgraphy-Factorization methods due to Fermat, RSA.

BOOKS PRESCRIBED:

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

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- know about some fascinating discoveries related to properties of prime numbers.
- understand the study of integers and integer-valued functions.
- apply number theory in many applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- understand the various types of numbers and their properties, various arithmetic functions.
- understand the concept of G.C.D. and L.C.M. of numbers and the relation of linear Diophantine equations and congruences which will help to solve various arithmetic problems.

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Syllabus for

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

COURSE CODE: BHM-354

COURSE TITLE: PDE and System of ODE

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 HRS.

Time: 3 hrs. **MAXIMUM MARKS: 75**

Medium: English **(THEORY : 56**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Partial Differential Equations:

Basic concepts and Definitions, Mathematical Problems. First Order Equations: Classification, Construction and Geometrical Interpretation. Method of Characteristics for obtaining General Solution of Quasi Linear Equations.

Unit-II

Partial Differential Equations:

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

Unit-III

System of Ordinary Differential equations:

Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients.

Unit-IV

System of Ordinary Differential equations:

Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients.

BOOKS PRESCRIBED :

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

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COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand the theory of partial& ordinary differential equations which stems from the intensive and extensive study of a few basic equations of mathematical physics.
- Apply Partial& ordinary differential equation (PDE&ODE) models for the physiological modeling of the evolution of a biological substance.
- Understand the different methods to solve linear PDEs and ODEs.
- predict the behavior of certain real phenomena by identifying them as models of partial and ordinary derivatives equations.
- apply the method of separation of variables for solving many well- known second order PDEs.

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Syllabus for

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

COURSE CODE: CS-BHM-351

COURSE TITLE: Introduction to Python

Time: 3 HOURS **CREDIT HOURS (PER WEEK): 4**

Medium: English **TOTAL HOURS:60 HRS.**

MAXIMUM MARKS:50

(THEORY MARKS: 28, PRACTICAL MARKS: 10, INTERNAL ASSESSMENT MARKS: 12)

Note: 1. Medium of Examination is English Language.

2. 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 **01 mark** with answer to each question up to 10 lines in length. The total weightage being **06 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 **5.5 marks.** The total weightage of this section shall be **11 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 **5.5 marks.** The total weightage of this section shall be **11 marks**.

COURSE OBJECTIVES:

1.	To understand why Python is a useful scripting language for developers.
2.	To learn how to design and program Python applications.
3.	To learn how to identify Python object types.
4.	To define the structure and components of a Python program.
5.	To learn how to read and write files in Python.

COURSE CONTENT:

UNIT-I

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

UNIT-II

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

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summary, Basic Data modeling, Programming with multiple tables

PRESCRIBED 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: 978-8120348675
4. Introduction to Computating& Problem Solving Through Python, Jeeva Jose and Sojan P. Lal,Khanna Publishers, 2030, ISBN-13: 978-9382759810
5. Introduction to Computing and Programming in Python, Mark J. Guzdial, Pearson Education, 2030, ISBN-13: 978-9332556591
6. Fundamentals of Python by Kenneth Lambert, Course Technology, Cengage Learning , 2030
7. Learning Python by Mark Lutz, 5th Edition, O'Reilly Media, 2013

COURSE OUTCOMES:

- To impart knowledge of one of the latest and powerful programming languages – Python.
- To make students understand about to read and write files.
- To give a broad view of concept of Object Oriented Programming (OOP) applied in Python.
- To learn how to connect Python programs to a database.
- To learn how to identify Python object types.

Khalsa College, Amritsar
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Syllabus for
PROGRAMME: B.Sc. (Hons.) Mathematics
Semester-V
Python (Lab)

Development of programs using python for control structures, list, functions and iterations.

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Syllabus for

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

COURSE CODE: BHM-355

COURSE TITLE: Seminar and Assignment

CREDIT HOURS (PER WEEK): 2

Time: 3 HOURS | **TOTAL HOURS: 30 HRS**

MEDIUM:ENGLISH | **MAXIMUM MARKS:25**

(Presentation: 20
Internal Assessment: 05)

COURSE OBJECTIVES:

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

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- to develop presentation skills.
- to inculcate discussion abilities, flexibility of thought and effective time management.
- apply theories, methods, and concepts from multiple fields to single concept.
- improve listening skills and develop persuasive speech, present information in a well-structured and logical sequence.
- experience to face a panel in logical way.

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI
COURSE CODE: BHM- 361
COURSE TITLE: Statistical Techniques

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

Time: 3 Hours **MAXIMUM MARKS: 70**
Medium: English **(Theory: 52**
Internal Assessment: 18)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- to help the students to use statistics in engineering and science like disease modeling, climate prediction networks etc.
- to quantify the uncertainty and assess the accuracy of our inference about the population.
- learn to establish linear association between two variables by using Correlation.
- use regression to predict the behavior of dependent variable.

COURSE CONTENT:

Unit-I

Scope and limitation of statistics, Tabulation and classification of data, measures of central tendency, measures of dispersion, skewness, Kurtosis, moments.

Unit-II

Relation between moments about mean in terms of moments about any point, Correlation Analysis: Introduction, Karl Pearson's coefficient of Correlation, Spearman's Rank Correlation coefficient

Unit-III

Concept of linear regression, properties of Regression coefficients, lines of regression, standard error of estimate, curvilinear regression.

Unit-IV

Curve Fitting: Principle of least squares, Fitting of straight line, second degree polynomial, geometric curve, exponential curve.

BOOKS PRESCRIBED :

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia, 2006.
3. S.C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics, S. Chand & Sons..
4. Alexander M. Mood, Franklin A. Graybill and Duane C. Boes, Introduction to the Theory of Statistics, 3rd Ed., Tata McGraw- Hill, Reprint 2007

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COURSE OUTCOMES: On completing the course, the students will be able to:

- quantify the uncertainty and assess the accuracy of our inference about the population.
- learn to establish linear association between two variables by using Correlation.
- find the best fit for a set of data points with the help of method of least square.
- use regression to predict the behavior of dependent variable.

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Syllabus for

PROGRAMME: B.Sc. Hons. (Mathematics) Sem-VI
COURSE CODE: BHM- 362
COURSE TITLE: Numerical Analysis

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

Time: 3 Hours **MAXIMUM MARKS: 70**
Medium: English **(Theory: 52**
Internal Assessment: 18)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit–I

Error generation, propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Iteration method, Newton's Method, Generalized Newton's Method, Method of false position, Muller's method, Rate of convergence of these methods. Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi’s Method, Gauss Seidel Method.

Unit- II

Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator.

Unit–III

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.

Unit- IV

Gaussian integration method, Gaussian legendre integration. Double numerical integration. Numerical solution of ordinary differential equations, Initial value problem, Taylor's method, Euler's methods, Picard's method, Milne's Method, Runge-Kutta Method. Predictor- Corrector's Method.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the use of Numerical analysis in detecting errors in numerical calculations.
- solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.
- have the knowledge of the study of algorithms that use numerical approximation for the problems of mathematical analysis.
- apply numerical analysis in all the fields of engineering, physical sciences, life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.

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Syllabus for

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

COURSE CODE: BHM- 363

COURSE TITLE: Discrete Mathematics and Graph Theory

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs.

Time: 3 Hours **MAXIMUM MARKS: 70**

Medium: English **(Theory: 52**

Internal Assessment: 18)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To gain knowledge about computing and mathematics appropriate to the discipline.
- To represent the problem using propositional logic and convert it as gates and truth table.
- To visualize the given problem as graphical representation.
- To get familiar with the concept of lattices.

COURSE CONTENT:

Unit-I

Mathematical Logic : Propositions. Basic logical operators and their truth tables, Logically equivalent statements. Conditional and Biconditional statements. Tautology and Contradictions. Law of duality. Converse,Inverse and Contrapositive of a statement.

Unit-II

POSETS : Cartesian product of sets. Binary Relations. Equivalence relations. Partial Order Relations. Partially ordered sets (POSETS), Hasse Diagrams.

Unit-III

Graph Theory : Definition, examples and basic properties of graphs . Simple graph, Multi Graph, Complete Graph, Null Graph, Di- graph, Mixed Graph. Incidence. Degree of a vertex. Order and size of graph. First theorem of Graph theory and its applications. Complement of a graph.

Unit-IV

Regular and k – regular graph. Bipartite Graph and Complete Bipartite Graph. Matrix representation of a graph. Adjacency matrix and Incidence matrix.

Lattices : Lattices as Algebraic system. Basic properties of lattices. Direct product and Homomorphism. Some special lattices (Bounded, Distributive and Complemented Lattices).

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- interpret the results of lattices in various engineering problems.
- aquaint themselves for a wide range of applications in analyzing, designing and simplifying electronic devices including digital computer, dial telephone, switching system and different kind of control devices.
- Understand the graph theory consisting of vertices and edges.
- learn to apply the graphs in finding the travelling routes.

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Syllabus for

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

COURSE CODE: BHM-364

COURSE TITLE: Dynamics

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs.

Time: 3 Hours | **MAXIMUM MARKS: 70**

Medium: English | **(Theory: 52**

Internal Assessment: 18)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Rectilinear motion in a straight line with uniform acceleration, Newton's laws of motion.Motion of two particles connected by a string.

Unit-II

Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit-III

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum.

Unit-IV

Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES:

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

- Handle the problems based on rectilinear motion.
- Use Newton's laws of motion in numerical problems.
- Deal with problems based on variable acceleration.
- Use concepts of work, power and energy to solve practical problems.

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Syllabus for

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

COURSE CODE: BHM-365

COURSE TITLE: Linear Algebra

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs.

MAXIMUM MARKS: 70

Medium: English **(THEORY : 52**

Time: 3 Hours **INTERNAL ASSESSMENT: 18)**

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENTS:

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Unit–I

Definition of 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

Unit-II

Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis. Invariance of the number of elements of the basis set.

Dimension of sum of two subspaces. Quotient space and its dimension.

Unit–III

Linear transformation. Algebra of linear transformation. Rank- Nullity theorem, Isomorphism and Isomorphic spaces.

Unit-IV

Matrix of a linear transformation. Changes of basis, Linear operator.

BOOKS PRESCRIBED

1. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002**.**
2. M. Artin, *Abstract Algebra*, 2nd Ed., Pearson, 2011.
3. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.

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4. Joseph A. Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa Publishing House, New Delhi, 1999.
5. S. Lang, *Introduction to Linear Algebra*, 2nd Ed., Springer, 2005.
6. Gilbert Strang, *Linear Algebra and its Applications*, Thomson, 2007.
7. S. Kumaresan, *Linear Algebra- A Geometric Approach*, Prentice Hall of India,1999.
8. Kenneth Hoffman, Ray Alden Kunze, *Linear Algebra*, 2nd Ed., Prentice-Hall of India Pvt.Ltd., 1971.
9. D.A.R. Wallace, *Groups, Rings and Fields*, Springer Verlag London Ltd., 1998

COURSE OUTCOMES: On successful completion of this course, students will be able to :

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

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Syllabus for

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

COURSE CODE: BHM-366

COURSE TITLE: Seminar and Assignment

CREDIT HOURS(PER WEEK): 2

TOTAL HOURS: 30 hrs.

MAX. MARKS: 25

(Presentation: 20

Internal Assessment: 05)

COURSE OBJECTIVES:

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

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- To develop presentation skills in the students.
- To inculcate discussion abilities, flexibility of thought and effective time management in students.
- To enable the students to apply theories, methods, and concepts from multiple fields to single concept.
- To improve listening skills and develop persuasive speech, present information in a well-structured and logical sequence.
- To experience to face a panel in logical way.

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Syllabus for

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

COURSE CODE: CS-BHM- 361
COURSE TITLE: R PROGRAMMING

TIME: 3 HOURS **CREDIT HOURS (PER WEEK): 4**
TOTAL HOURS:60 HRS.
MAXIMUM MARKS: 50
(THEORY MARKS: 28, PRACTICAL MARKS: 10,
INTERNAL ASSESSMENT MARKS: 12)

Note: 1. Medium of Examination is English Language.
2. 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 **01 mark** with answer to each question up to 10 lines in length. The total weightage being **06 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 **5.5 marks.** The total weightage of this section shall be **11 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 **5.5 marks.** The total weightage of this section shall be **11 marks**.

COURSE OBJECTIVES:

1. This course introduces R, which is a popular statistical programming language.
2. The course covers data reading and its manipulation using R, which is widely used for data analysis internationally. The course also covers different control structures and design of user-defined functions.

3. Learn how to develop the program in R Programming. Learn how to develop an open-source scripting language predictive analytics and data visualization.

Unit-I

Downloading and installation of R and RStudio. Introducing to R, and Rstudio. Help functions in R, Vectors, Common Vector Operations, Using all and any function, subletting of vector. Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns , lists, Creating lists, general list operations, Accessing list components and values, applying functions to lists, recursive lists.

Creating Data Frames – Matrix-like operations in frames , Merging Data Frames, Applying functions to Data frames, Factors and Tables , factors and levels , Common functions used with factors Control statements: Loops, looping Over Nonvector Sets, if-else , writing user defined function, scope of the variable, R script file.

Unit II

Input/ Ouput: scan () , readline () Function, recursion, replacement functions, Printing to the Screen Reading and writing CSV and text file. Math functions, function for statistical distributions, linear algebra operations on vector and matrices, Basic of simulation, simulation programming in R: Built random variable generator, object –oriented programming: S3 generic functions, writing S3 and S4 Classes.

String manipulation, Graphics in R: Graph Syntax (title, xlabel, ylabel, pch, lty, col.), Simple graphics (Bar, Multiple Bar, Histogram, Pie, Box-Plot, Scatter plot, qqplot), Low-level and High- Level plot functions, par() command to generate multiple plots. Customizing graphs, saving graph to file, performance enhancement: speed and memory, functional programming and memory issue, Debugging.

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BOOKS PRESCRIBED:

1. Dennis, B. (2013): The R Student Companion, Taylor & Francis Group.

2. Matloff, N. (2011): The Art of R Programming: A Tour of Statistical Software Design,
3. William. Lander, J. P. (2014): R for Everyone: Advanced Analytics and Graphics,
4. Addison-Wesley Data & Analytics Series.

COURSE OUTCOMES:

- Develop an R script and execute on R Programming Environment.
- Install, load and deploy the required packages, and build new packages for sharing and reusability.
- Utilize R Data types for developing programs and learn all the basics of R-Programming (Data types, Variables, and Operators.
- Join columns and rows in a data frame using bind functions, developing packages, data frames, and string manipulation functions.
- Implement different data structures such as vectors , list matrix etc.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc. (Hons.) Mathematics

Semester-VI

R Programming (Lab)

Evaluating mathematical functions: exp(x), log(x), sin(x), cos(x), etc using Taylor series expansion; sorting, searching, maximum, minimum of numbers, Simulation: find integration, mean, variance of statistic based on a sample drawn from various distribution, p-values; graphs of functions; file handling; statistical analysis: graphical representation of data frequency distribution, correlations linear regression

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2024

Programme Code: MMAT

Programme Name: M.SC. (MATHEMATICS)

(Semester I- IV)

Examinations: 2022-2024

Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

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PROGRAMME: M.SC. (MATHEMATICS)
PROGRAMME CODE: MMAT

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

ELIGIBILITY:

The Candidate who has passed

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

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

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

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

PROGRAMME OBJECTIVES:

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

PROGRAMME SPECIFIC OUTCOMES:

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

Scheme for PROGRAMME:M.Sc. Mathematics

PROGRAMME CODE:MMAT

Semester-I

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHM-411	Real Analysis-I	75	25	100	90
2.	MHM-412	Algebra-I	75	25	100	90
3.	MHM-413	Applied Linear Algebra	75	25	100	90
4.	MHM-414	Number Theory	75	25	100	90
5.	MHM-415	Complex Analysis	75	25	100	90
6.	MHM-416	Differential Equations	75	25	100	90
Total			450	150	600	540

Semester-II

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHM-421	Real Analysis-II	75	25	100	90
2.	MHM-422	Algebra-II	75	25	100	90
3.	MHM-423	Probability Theory	75	25	100	90
4.	MHM-424	Classical Mechanics and Calculus of variations	75	25	100	90
5.	MHM-425	Differential Geometry	75	25	100	90
6.	MHM-426	Mathematical Methods	75	25	100	90
Total			450	150	600	540

Semester-III

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	MHM-531	Measure Theory	75	25	-	-	100	90
2.	MHM-532	Functional Analysis-I	75	25	-	-	100	90
3.	MHM-533	Statistical Inference	60	20	15	05	100	90
4.	MHM-534	Operations Research-I	75	25	-	-	100	90
5.	MHM-535	Discrete Mathematics-I	75	25	-	-	100	90
6.	CS-MHM-531	Introduction to Computer and Information Technology	56	19	18	07	100	60
Total			416	139	33	12	600	510

Semester-IV

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Practical Max. Marks	Assessment In Practical	Total	Hrs.
1.	MHM-541	Topology	75	25	-	-	100	90
2.	MHM-542	Functional Analysis-II	75	25	-	-	100	90
3.	MHM-543	Field Extension and Galois theory	75	25	-	-	100	90
4.	MHM-544	Operations Research-II	75	25	-	-	100	90
5.	MHM-545	Discrete Mathematics-II	75	25	-	-	100	90
6.	CS-MHM-541	Programming in C	56	19	18	07	100	60
Total			431	144	18	07	600	510

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE-MHM- 411

COURSE TITLE: REAL ANALYSIS-I

COURSE CREDIT(PER WEEK): 6
TOTAL HOURS: 90 hrs.

Medium: English **MAXIMUM MARKS: 100**
TIME: 3HRS. **(Theory Marks: 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

Compactness of k- cells, Compact subsets of Etor set, Separated sets, connected sets in a metric space, connected subsets of real line.

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES : On completing the course, the students will be able to:

- introduces students to the fundamentals of mathematical analysis and reading and writing mathematical proofs.

Chairperson, BoS in Mathematics

- Correlate Calculus with real analysis by finding infinite sums and evaluating limits to understanding the concept of continuity and uniform continuity one is doing real analysis.
- 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.
- Realizes how these notions are generalized from real line to metric spaces.

KHALSA COLLEGE, AMRITSAR

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-I)
COURSE CODE-MHM- 412

COURSE TITLE: ALGEBRA – I

CREDIT HOURS(PER WEEK):6
TOTAL HOURS: 90 hrs.

Time: 3Hrs **MAXIMUM MARKS: 100**
Medium: English **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To get familiar with the concept of group.
- To study various properties of group, subgroup, normal group, cyclic group etc.

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

1. Artin,. M : Algebra, Prentice-Hall, 1991
2. J. Gallian : Contemporary Abstract Algebra.
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

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6. Surjit Singh & Quazi Zamerudin. Modern Algebra, Vikas Pub. House.

COURSE OUTCOMES: On completing the course, the students will be able to:

- recognize the foundation required for more advanced studies in Algebra.
- use group theory in modern physics which is based on symmetry principles.
- apply group theory such that the existence of several particles can be predicted before they are experimentally observed.
- apply group theory in chemistry such as the symmetry of a molecule provides students with the information of energy levels of the orbital , the orbital symmetries,bond order.

to develop the reasoning, logic and calculative ability in mathematics.

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(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc. Mathematics (Semester-I)
COURSE CODE-MHM- 413

COURSE TITLE: APPLIED LINEAR ALGEBRA

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100
(Theory : 75
Internal Assessment: 25)

Time: 3Hrs
Medium: English

INSTRUCTIONS FOR PAPER SETTERS

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

2.The Section–A will consists of five compulsory questions each of one mark.

3. Each section B, C, D & E will consist of two questions (**each question should be subdivided into atleast two parts**) and students are required to attempt a total of 5 questions by selecting at least one question from each section. Each question will carry fourteen marks.

4. Question paper should cover at least 40% article work from the recommended books.

5. Teaching time for this paper will be eight periods per week.

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COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

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BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- deepen their understanding of Linear Algebra.
- become familiar with the concepts of linear independence, basis, span, linear maps, the properties of linear transformations and orthogonal decomposition of inner product spaces.
- have a good knowledge of inner product spaces, and will be able to define and use the adjoint of a linear map on a finite-dimensional inner product space.
- construct the matrix of a bilinear form and to find index, rank and signature of a bilinear form.
- determine a linear operator is normal, unitary and orthogonal projection and to construct the spectral decomposition of normal and self-adjoint operators.

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-I)
COURSE CODE-MHM- 414

COURSE TITLE:NUMBER THEORY

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

Time: 3Hrs | **MAXIMUM MARKS: 100**
Medium: English | **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-1

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

Unit-II

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

Unit-III

Quadratic residue modulo a prime, Euler's criterion, The Legendre symbol and its properties, Gauss Lemma, Quadratic reciprocity law, Jacobis symbol and its Properties, Pythagorean triplets, Insolvability of Diophantine equation $x^4 + y^4 = z^4$, $x^4 - y^4 = z^2$ in positive integers.

Unit-IV

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Form the bridge between pure mathematics and applied mathematics.
- Apply Number Theory in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- understand the various types of numbers and their properties.
- use various arithmetic functions and the concept of congruences to solve various arithmetic problems.
- Analyze the study of integers and integer-valued functions.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-I)
COURSE CODE: MHM- 415

COURSE TITLE:COMPLEX ANALYSIS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

Time: 3Hrs **MAXIMUM MARKS: 100**
Medium: English **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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.

COURSECONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the properties of analytic functions.
- to understand the concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE-MHM- 416

COURSE TITLE: DIFFERENTIAL EQUATIONS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSECONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to express laws of nature with the help of differential equations.
- know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
- to focus on the equations and techniques most useful in science and engineering.
- Understand properties of solutions of differential equations is fundamental to much of contemporary science and engineering.
- learn to formulate, classify and transform first order partial differential equation into canonical forms.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-II)
COURSE CODE-MHM- 421

COURSE TITLE:REAL ANALYSIS -II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

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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)

COURSE OUTCOMES: On completing the course, the students will be able to:

- study the behavior of sequences and series of functions.
- Get familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
- Analyze the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.
- understand Riemann Stieltjesintegrability 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 Weierstrass Approximation Theorem .

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE-MHM- 422

COURSE TITLE: ALGEBRA –II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To have an idea about the concept of ring.
- To study various properties of rings and subrings.
- To get familiar with the concept of modules.

COURSE CONTENT:

Unit I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

1. Fraleigh, J. B.: A first course in Abstract Algebra 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.

Chairperson, BoS in Mathematics

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use ring theory in wide areas of current research in mathematics, computer science and mathematical/theoretical physics.
- introduce themselves with the concepts and develop working knowledge on simple ring and ring homomorphism.
- know the structure of rings, their representations, modules, special classes of rings (group rings, division rings, and universal enveloping algebras).
- Deal with developments of commutative ring theory, which is a major area of modern mathematics.
- appreciate the significance of unique factorization in rings and integral domains.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

COURSE CODE-MHM- 423

COURSE TITLE: PROBABILITY THEORY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

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BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- acquaint with the foundation of probabilistic and statistical analysis, mostly used in engineering and science like disease modeling, climate prediction networks etc.
- take informed decisions about a population by examining only a small random sample of the members of that population.
- quantify the uncertainty and assess the accuracy of our inference about the population.
- have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set.
- become informed consumer of statistical information provided in newspaper, magazine and journals.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-II)
COURSE CODE-MHM- 424

COURSE TITLE: CLASSICAL MECHANICS AND CALCULUS OF VARIATIONS

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

Variational problems with fixed boundaries, Transversality conditions, Orthogonality conditions, Sturm-Liouville's theorem on extremals, one sided variations, Hamilton's principle, The principle of least action, Langrange's equations from Hamilton's principle.

Unit-IV

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- apply the classical mechanics approach to solve a mechanical problem.
- understand the concept of functional and determine stationary paths of a functional to deduce the differential equation for stationary paths.
- describe and understand the motion of a mechanical system using Lagrange Hamilton formalism.
- recognize the degrees of freedom and understand the concept of generalized coordinates.
- apply the concepts of classical mechanics in Geology, engineering, and many other inter-disciplinary areas.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-II)
COURSE CODE-MHM- 425
COURSE TITLE: DIFFERENTIAL GEOMETRY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- The aim of this course is to get the students familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals, the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

COURSE CONTENT:

Unit – I

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

Unit – II

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

Unit-III

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

Unit-IV

Surfaces in R^3**:** Implicit and Explicit forms for the equation of the surface, the two fundamental forms of a surface, Family of surfaces, Edge of regression, Envelops, Ruled surface, Developable and skew surfaces, Gauss and Weingarten formulae.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals.
- know the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE-MHM- 426

COURSE TITLE: MATHEMATICAL METHODS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

1. Tricomi, F.G. : Integral Equation (Ch. I and II) Kanwal R, P :
2. Kanwal R. P: Linear Integral Equations

Chairperson, BoS in Mathematics

3. S.G. Mikhlin: Integral Equations
4. Pinckus, A. and Zafrany, S.: Fourier Series and Integral Transforms

COURSE OUTCOMES: On completing the course, the students will be able to:

- prepare themselves with mathematical tools and techniques that are required in advanced courses offered in the applied mathematics and engineering problems.
- apply concept of mathematical methods in diverse areas of science and technology such as electric analysis, communication engineering,solution of partial differential operation.
- learn to solve the Integral equations which are encountered in various problems including radiative transfer, and the oscillation of a string, membrane, or axle.
- Understand the concept of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
- interpret the concept of Volterra and Fredholm integral equations and find solutions of these equations using various methods

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-III)
COURSE CODE-MHM- 531

COURSE TITLE: MEASURE THEORY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs | **(Theory : 75**
Medium -English | **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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.
- It will give the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.

COURSE CONTENT:

Unit-I

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

Unit-II

The motivation behind Measurable Functions, various Characterizations and Properties of Measurable functions: Sums, Products and Compositions Sequential Pointwise Limits and Simple Approximations to Measurable Functions. Littlewood’s three principles.

Unit-III

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-IV

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.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

1. Royden,H.L and P.M. Fitzpatrik; Real Analysis (Fourth Edition), Pearson Education Inc.New Jersey, U.S.A (2010).
2. R.A. Gordon, The integrals of Lebesgue, Denjoy, Perron and Henstock, Amer. Math.Soc. Province, RI, (1994).
3. Barra, G De: Introduction to Measure Theory, Van Nostrand and Reinhold Company.
4. Jain, P.K. ,Gupta, V.P. and Pankaj Jain : Lebesgue Measure and Integration, New Age International Publishers.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use concepts of mathematical analysis to determine the sizes of sets.
- Know about natural extension of Riemann integral which allows for better understanding of the fundamental relations between differentiation and integration.
- applyLebesgue integration in many areas, including Functional Analysis, Harmonic Analysis and Probability Theory.
- acquire the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.
- extend the concept of outer measure in an abstract space.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-III)
COURSE CODE: MHM- 532

COURSE TITLE: FUNCTIONAL ANALYSIS-I

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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.
- To study the certain classes of functions defined in functional spaces.
- Students will learn the applications of Hahn- Banach theorem.

COURSE CONTENT:

Unit-I

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

Unit-II

Equivalent norms,Finite dimensional normed linear spaces and compactness, Riesz Lemma, The conjugate space N*.

Unit-III

The Hahn-Banach theorem and its consequences. The natural imbedding of N into N**, reflexivity of normed spaces.

Open mapping theorem, projections on a Banach space, closed graph theorem, uniform boundedness principle.

Unit-IV

Conjugate operators. L_P -spaces: Holder's and Minkowski,s inequalities, completeness of L_P-spaces.

BOOKS PRESCRIBED:

1 .G.F. Simmons: Introduction to Topology and Modern Analysis, Ch. 9, Ch.10 (Sections 46 - 51), Mc.Graw-Hill International Book Company, 1963.
2. Royden, H. L. & P.M. Fitzpatrik: Real Analysis, Ch 6 (Sections 6.1 -6.3), Macmillan Co. 1988.
3. Erwin Kreyszig : Introduction. to Functional Analysis with Applications John Wiley & Sons,1978.

Chairperson, BoS in Mathematics

4. Balmohan V. Limaye: Functional Analysis, New Age International Limited.
5 .P.K.Jain and O.P Ahuja : Functional Analysis, New Age International (P) Ltd Publishers, 2010
6. K. Chanrashekhra Rao : Functional Analysis, Narosa, 2002
7. D. Somasundram: A First Course in Functional Analysis, Narosa, 2006

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the main concepts and fundamental methods of functional analysis to treat various concrete problems based on Banach spaces.
- study the certain classes of functions defined in functional spaces.
- learn the various examples of banach spaces.
- verify the requirements of a norm and completeness with respect to a norm.
- compute the spectrum of operators and classify the set into sub-classes.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-III)
COURSE CODE-MHM- 533

COURSE TITLE: STATISTICAL INFERENCE

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100
(Theory Marks: 60
Internal Assessment Theory Marks: 20
Practical Marks: 15
Practical Internal Assessment Marks: 05)

Time: 3Hrs
Medium -English

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Point Estimation: Estimators, Properties of unbiasedness, consistency, sufficiency, efficiency, completeness. Methods of estimation: maximum likelihood estimator, properties of MLE(without proof), method of moments, Neyman factorization theorem, Minimum variance unbiased estimators.

Unit II

Rao Blackwell Theorem, Cramer-Rao lower bound. Concepts of testing of hypotheses, critical region, two types of errors, power function, level of significance, p-value. Neyman-Pearson Theorem, M.P. test, UMP test, Likelihood ratio property.

Unit-III

Applications of Sampling Distributions: Test of mean and variance in the normal distribution, Tests of single proportion and equality of two proportions, t-test, Chi-square test and F-test. Large sample tests.

Unit-IV

Linear Estimation: Gauss Markov linear models, BLUE, Gauss Markov Theorem, estimation with linear restrictions on parameters, residual sum of squares, Analysis of variance, Analysis of variance for one way and two way classified data with one observation per cell.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- Solve the problems based on estimation and to test the efficiency of various estimators.
- Handle the practical problems using hypothesis testing.
- Solve the practical problems using t-test, F-test, Z-test, chi-square test for various types of data.

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE-MHM- 534

COURSE TITLE: OPERATIONS RESEARCH-I

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Mathematical formulation of linear programming problem, properties of a solution to the linear programming problem, generating extreme point solution, simplex computational procedure, development of minimum feasible solution, the artificial basis techniques, a first feasible solution using slack variables,

Unit-II

Two phase and Big-M method with artificial variables.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.

Unit-III

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.

Chairperson, BoS in Mathematics

Unit - IV

Assignment Problems: Mathematical formulation of assignment problem, the assignment method, typical assignment problem, the traveling salesman problem. Game Theory: Two-person zero sum games, maximin-minimax principle, games without saddle points (Mixed strategies), graphical solution of $2 \times n$ and $m \times 2$ games, dominance property, arithmetic method of $n \times n$ games, general solution of $m \times n$ rectangular games.

BOOKS PRESCRIBED:

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

COURSE OUCOMES: On completing the course, the students will be able to:

- understand special situations such as redundancy, infeasibility, unboundedness and alternate optimal solutions in linear programming problems.
- acquire quantitative, analytical tools to support decision making in the optimization of economic processes.
- develop the functional mathematical relationship that describe decision variables, objective function, constraints of the problem and non-negativity conditions.
- decide optimum allocation of various limited resources to arrive at the optimum decision by using various techniques like assignment, transportation problems etc.
- extend their knowledge of basic optimization techniques to do interesting research work on these types of optimization techniques.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-III)
COURSE CODE-MHM- 535

COURSE TITLE: DISCRETE MATHEMATICS-I

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

Lattices : Equivalence Relations, Partial Order Relations, Partial ordered sets, Hasse diagrams, isomorphism, lattices, lattices as algebraic system, sub-lattices, direct product and homomorphism.

Unit - IV

Graphs: Simple graphs, multi graphs, incidence and degree, regular graph, isolated vertex, pendent vertex, null graph, Diagraph, connected graph, bipartite graph, isomorphisms, Eulerian graphs, Planar and dual graph, planner graph representations.

Chairperson, BoS in Mathematics

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BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able 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.
- learn Grammar as an algebraic system that describes the process by which instances of a language can be constructed.
- Understand mathematical structure for accepting or rejecting strings (words) in a language.
- explore and apply the basic method in subsequent courses in the design and analysis algorithms, computability theory and software engineering.
- Apply the concepts of discrete mathematics in analyzing, designing and simplifying electronic devices including digital computer, dial telephone, switching system and different kind of control devices.

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Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-III)
COURSE CODE-CS-MHM- 531
COURSE TITLE: Introduction to Computers and Information Technology

CREDIT HOURS(PER WEEK): 4
TOTAL HOURS: 60hrs.
MAXIMUM MARKS: 100

Medium: English
Time: 3 Hour

(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**.

Course Objectives:

- To familiarize the various parts of computer.
- To study application of computers in different fields.
- To recall the evolution of computers through various generation.
- To acquire the knowledge of working of input and output devices.
- To impart the knowledge of operating system and its types.
- Hands on practice of MS office 2010

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 operations graphs.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES (COS):

At the end of course students will be able to:

- Acquire the computer terminology
- Gain insight of working of input and output devices.
- Develop skills of working with MS-Word, MS-PowerPoint, MS-excel.
- Possess the knowledge of importance of operating system in computer.
- Understand the concept of storing of data in memory and its types.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-IV)
COURSE CODE-MHM- 541

COURSE TITLE: TOPOLOGY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Topological spaces, Continuous functions, Homeomorphisms, Countability axioms, Product spaces and quotient spaces, Topological groups.

Unit-II

Connectedness, Intermediate value theorem and uniform limit theorem, Local connectedness,

Unit-III

Compactness, Finite Intersection Property (F.I.P.), Cantor"s intersection theorem,, Uniform continuity, Bolzano-Weierastrass Property, Local compactness, Metrizable topological spaces, The Tychonoff Theorem.

Unit-IV

Separation axioms, Hausdorff spaces, Regular Spaces, Normal spaces, Urysohn's Lemma, Completely regular spaces, , Urysohn's Metrization Theorem, The Tietze extension theorem, Completely normal spaces.

BOOKS PRESCRIBED:

Chairperson, BoS in Mathematics

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending.
- discuss the shape of molecules in chemistry by analysis of the topology of a related graph.
- Understand the mathematical tools that are useful to applied mathematicians and to theoretical physicists.
- Apply the knowledge of topology in computers specially in network science.
- understand the various topological spaces and their properties, separation axioms, Tietz extension theorem and Tychnoff theorem

Khalsa College, Amritsar

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Syllabus for

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

COURSE CODE-MHM- 542

COURSE TITLE: FUNCTIONAL ANALYSIS-II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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 Hilbert spaces.
- Students will study the conjugate spaces and their properties.
- Students will learn about compact linear operators and spectral theory.

COURSE CONTENT:

Unit -1

Inner product spaces, Hilbert spaces, orthogonal complements, orthonormal sets,

Unit-II

The conjugate space H*,Strong and weak convergence in finite and infinite dimensional normed linear spaces. Weak convergences in Hilbert spaces, weakly compact set in Hilbert spaces.

Unit-III

The adjoint of an operator, self adjoint operators, positive operators, normal operators, Unitary operators. Projections on a Hilbert space.

Unit-IV

Spectral Theorem for normal operators, Compact linear operators on normed spaces, properties of Compact linear operators.

BOOKS PRESCRIBED:

1. Simmon G.F.:Introduction to topology and Modern Analysis Ch.X (sections 52-59) Ch. XI (Sections 61-62) Mc Graw- Hill (1963) International Book Company.

Chairperson, BoS in Mathematics

2. Erwin Kreyszig: Introduction to Functional Analysis with Applications, John Wiley & Sons (1978).
3. Limaye, Balmohan V.: Functional Analysis, New Age International Limited, 1996.
4. Jain, P.K. & Ahuja, O.P.: Functional Analysis, New Age International (P) Ltd. Publishers, 2010
5. Chandrasekhra Rao, K.: Functional Analysis, Narosa, 2002.
6. Somasundram, D.: A First Course in Functional Analysis, Narosa, 2006.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the main concepts and fundamental methods of functional analysis to enable a student to treat various concrete problems based on Hilbert spaces .
- Study functional spaces which play vital role in study of existence and uniqueness of solutions of differential equations, boundary value problems, optimization techniques etc.
- distinguish between Banach spaces and Hilbert spaces.
- classify operators into self-adjoint, unitary and normal operators.
- represent a bounded linear functional in terms of inner product.

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-IV)
COURSE CODE-MHM- 543
COURSE TITLE: FIELD EXTENTIONS AND GALOIS THEORY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs | **(Theory : 75**
Medium -English | **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To understand the concept of finite and infinite fields.
- To get familiar with various field extensions such as simple extension, separable extensions etc.
- To learn the formation of finite fields.
- To get familiar with Galois Theory.

COURSE CONTENT:

Unit-I

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

Unit –II

Algebraic closure, Algebraically closed fields.Finite fields, Existence of GF(p^n), Construction of finite fields, Separable and purely inseparable extensions, Perfect fields.

Unit-III

Simple extentions, Primitive elements, Lagrange‟s theorem on primitive elements ,Normal extentions, Roots of unity. Galois extensions, The Fundamental theorem of Galois theory.

Unit-IV

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

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BOOKS PRESCRIBED:

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

COURSE OUTOCMES: On **successful completion of this course, students will be able to:**

- Deal with the problems based on finite and infinite fields.
- Detect the simple field, splitting field, perfect field etc.
- Have an idea of splitting field of a given polynomial.

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Syllabus for
PROGRAMME:M.Sc.-Mathematics
(Semester-IV)
COURSE CODE-MHM- 544
COURSE TITLE: OPERATIONS RESEARCH-II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- In this course basic concepts of Queuing theory and its generalized models are introduced.
- The course explains inventory control and inventory models for specific situations in an organization.
- The course is designed to introduce characteristics of single server/multi servers queuing models with limited and unlimited capacity.
- The course is designed to give detailed description of replacement problems, mortality theorems and simulation models.

COURSE CONTENT:

Unit-I

Queueing Theory: Introduction, Queueing System, elements of queueing System, distributions of arrivals, inter arrivals, departure service times and waiting times. Classification of queueing models, Queueing Models**:** (M/M/1) :(∞/FIFO), (M/M/1) :(N/FIFO), Generalized Model: Birth- Death Process, (M/M/C) :(∞/FIFO), (M/M/C) :(N/FIFO).

Unit-II

Inventory Control: The inventory decisions, costs associated with inventories, factors affecting Inventory control, Significance of Inventory control, economic order quantity (EOQ), Deterministic inventory problems without shortage and with shortages, EOQ problems with price breaks, Multi item deterministic problems.

Unit-III

Replacement Problems: Replacement of equipment/Asset that deteriorates gradually, replacement of equipment that fails suddenly, Mortality Theorem, recruitment and promotion problem, equipment renewal problem.

Unit-IV

Simulation: Need of simulation, methodology of simulation. Simulation models, event- type simulation, generation of random numbers, Monte Carlo simulation. Simulation of inventory problems, queueing system, Maintenance problems and job sequencing.

BOOKS PRESCRIBED:

1. R.Panneerselvam: Operations Research
2. Taha, H.A.: Operations Research
3. Chaddrasekhara, Rao & Shanti Lata Mishra: Operations Research
4. Kanti Swarup, Gupta, P.K. & Man Mohan: Operations Research
5. Mustafi, C.K.: Operations Research Methods & Practice.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Study the Operations Research for the purpose of making better decisions.
- learn about management and administration of socio-cultural behavior and economic factors that exist as bottleneck to effective implementation.
- analyze complex real life problems typically with the goal of improving or optimizing performance .
- develop more effective approaches to programming by using different queuing models,generalizedmodels,power supply model etc., customer's preference relating to the size,colour packaging
- determine the size of the stock to meet the future demand by applying inventory control methods,replacement problems

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Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-IV)
COURSE CODE-MHM- 545
COURSE TITLE: DISCRETE MATHEMATICS II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

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COURSE OBJECTIVES:

- To gain knowledge about computing and mathematics appropriate to the discipline
- To visualize the given problem as graphs and tree representation.
- To get familiar with the inclusion-exclusion principle and Pigeon hole principle.

COURSE CONTENT:

Unit-I

Trees **:** Tree, Rooted tree, search, spanning trees, minimal spanning trees, Kruskal's algorithm. Chromatic number, four-colour problem, chromatic polynomials.

Unit-II

Recurrence relation : Order and degree of recurrence relation, telescoping form, solution of linear recurrence relation, homogeneous solution, closed form expression

Unit-III

Generating functions : , Discrete Numeric Function, Generating function, Generating Functions of some standard sequences, solution of recurrence relations using generating functions.

Unit - IV

Combinatorics: Principle of mathematical induction**,** The basic of counting**,** Inclusion and exclusion principle, Pigeonhole principle.

BOOKS PRESCRIBED:

1. Trambley, J.P. and Manohar,R: Discrete Mathematical Structures with Applications to Computer Science.
2. Liu C.L.: Elements of Discrete Mathematics.
3. Alan Doerr and Kenneth Levasseur: Applied Discrete Structures for Computer Science
4. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Sciences

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COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn about Graph theory, the mathematics of network is one of the most important branches of discrete mathematics which is most useful for traveling salesman problems etc.
- learn to apply the trees and graphs in finding the travelling routes.
- Solve practical problems using inclusion-exclusion principle and Pigeon hole principle.

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Syllabus for
PROGRAMME:M.Sc.-Mathematics (Semester-IV)
COURS CODE- CS-MHM-541
COURSE TITLE:Programming in C

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

Medium: English **MAXIMUM MARKS: 100**
Time: 3 Hours **(Theory: 56**
Internal Assessment Theory: 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**.

COURSE OBJECTIVES:

- The course is designed to provide complete knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- Students will be able to learn the basic programming constructs and they can easily switch over to any other language in future.
- To use an array to store multiple pieces of homogeneous data, and use a structure to store multiple pieces of heterogenous data

COURSE CONTENTS:

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.

COURSE OUTCOMES (COS): Upon completion of this course, the students will be able to:

- Use the fundamentals of C programming in trivial problem solving
- Identify solution to a problem and apply control structures and user defined functions for solving the problem
- Demonstrate the use of Strings and string handling functions
- Ability to work with arrays of complex objects.
- Apply skill of identifying appropriate programming constructs for problem solving

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2024

Programme Code: MMAH

Programme Name: M.SC. (MATHEMATICS) (under the Hons. Scheme)
(Semester I- IV)

Examinations: 2022-2024

Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

PROGRAMME: M.SC. (MATHEMATICS) (under the Hons. Scheme)

PROGRAMME CODE: MMAH

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

ELIGIBILITY:

- B.Sc. (Hons.) Mathematics with atleast 50% of marks.

PROGRAMME OBJECTIVES:

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

PROGRAMME SPECIFIC OUTCOMES:

- Understand the nature of abstract mathematics and explore the concepts in various fields.
- Comprehend and write effective reports and design documentation related to mathematical research and literature, make effective presentations.
- To make them expertise in using ICT tools in solving problems in mathematics.
- Inculcate mathematical reasoning and assimilate complex mathematical ideas and arguments.
- Communicate mathematical ideas with clarity and coherence, both written and verbally.

Scheme for PROGRAMME:M.Sc. Mathematics (under the Hons. Scheme)

Semester-I

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHMH-411	Real Analysis-I	75	25	100	90
2.	MHMH-412	Modern Algebra	75	25	100	90
3.	MHMH-413	Applied Linear Algebra	75	25	100	90
4.	MHMH-414	Number Theory	75	25	100	90
5.	MHMH-415	Complex Analysis	75	25	100	90
6.	MHMH-416	Differential Equations	75	25	100	90
Total			450	150	600	540

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Semester-II

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHMH-421	Real Analysis-II	75	25	100	90
2.	MHMH-422	Advanced Algebra	75	25	100	90
3.	MHMH-423	Probability Theory	75	25	100	90
4.	MHMH-424	Classical Mechanics and Calculus of variations	75	25	100	90
5.	MHMH-425	Differential Geometry	75	25	100	90
6.	MHMH-426	Mathematical Methods	75	25	100	90
Total			450	150	600	540

Semester-III

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in theory	Practical Max. Marks	Assessment in Practical	Total	Hrs.
1.	MHMH-531	Measure Theory	75	25	-	-	100	90
2.	MHMH-532	Functional Analysis-I	75	25	-	-	100	90
3.	MHMH-533	Statistical Inference	60	20	15	05	100	90
4.	MHMH-534	Mechanics	75	25	-	-	100	90
5.	MHMH-535	Discrete Mathematics	75	25	-	-	100	90
6.	MHMH-536(A) OR MHMH-536(B)	Applied Statistics OR Project	75 75	25 25	-	-	100 100	90
Total			435	145	15	05	600	540

Semester-IV

Sr. No.	Course Code	Course Title	Theory Maximum Marks	Internal Assessment in theory	Total	Hrs.
1.	MHMH-541	Topology	75	25	100	90
2.	MHMH-542	Functional Analysis-II	75	25	100	90
3.	MHMH-543	Field Extension and Galois Theory	75	25	100	90
4.	MHMH-544	Operations Research-II	75	25	100	90
5.	MHMH-545	Sampling Theory	75	25	100	90
6.	MHMH-546	Special Functions	75	25	100	90
Total			450	150	600	540

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-I)
COURSE CODE-MHMH- 411

COURSE TITLE:REAL ANALYSIS -I

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

Compactness of k- cells, Compact subsets of Euclidean space R^k. Heine-Borel theorem, Perfect sets, The Cantor set, Separated sets, connected sets in a metric space, connected subsets of real line.

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

1. Walter Rudin: Principles of Mathematical Analysis (3rd Edition) McGraw- Hill td., Ch.2, Ch.3.
2. Simmons, G.F.: Introduction to Topology and Modern Analysis, McGraw-Hill Ltd. (App.1)

Chairperson, BoS in Mathematics

3. Shanti Narayan and P.K. Mittal : A Course of Mathematical Analysis.
4. S.C. Malik & Savita Arora: Mathematical Analysis, Wiley Eastern Ltd

COURSE OUTCOME: On completing the course, the students will be able to:

- introduces students to the fundamentals of mathematical analysis and reading and writing mathematical proofs.
- Correlate Calculus with real analysis by finding infinite sums and evaluating limits to understanding the concept of continuity and uniform continuity one is doing real analysis.
- 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.
- Realizes how these notions are generalized from real line to metric spaces

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-I)
COURSE CODE-MHMH- 412

COURSE TITLE:MODERN ALGEBRA

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- To understand Rings, Ring homomorphisms, Direct product of the rings and Euclidean Rings.
- To study the Composition series, Groups of automorphisms, Symmetric groups and Alternating groups.

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit IV

Rings, Subrings, Ideals, Factor rings, Homomorpghisms, Integral domains, Maximal and prime ideals. The field of quotients of an integral domain, Chinese remainder theorem, simple rings, Ideals of matrix rings.

BOOKS PRESCRIBED:

1.Artin,. M : Algebra, Prentice-Hall, 1991
2. I.N. Herstein,: Topics in Algebra, 2nd edition, Wiley I

Chairperson, BoS in Mathematics

3.Dummit, D.S.: Abstract-Algebra, John-Wiley & Sons, Students Edition-1999
& Foote
4.Fraleigh, J. B.: An Introduction to Abstract Algebra.
5. J Gallian : Contemporary Abstract Algebra, CENGAGE.
6.Surjit Singh & Quazi zamerrudin. Modern Algebra, Vikas Pub. House.

COURSE OUTCOMES: On completing the course, the students will be able to:

- recognize the foundation required for more advanced studies in Algebra.
- use group theory in modern physics which is based on symmetry principles.
- apply group theory such that the existence of several particles can be predicted before they are experimentally observed.
- apply ring theory in chemistry such as the symmetry of a molecule provides students with the information of energy levels of the orbital , the orbital symmetries,bond order.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-I)

COURSE CODE-MHMH- 413

COURSE TITLE: APPLIED LINEAR ALGEBRA

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.

Time: 3Hrs — **MAXIMUM MARKS: 100**
Medium: English — **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- deepen their understanding of Linear Algebra.
- become familiar with the concepts of linear independence, basis, span, linear maps, the properties of linear transformations and orthogonal decomposition of inner product spaces.
- have a good knowledge of inner product spaces, and will be able to define and use the adjoint of a linear map on a finite-dimensional inner product space.
- construct the matrix of a bilinear form and to find index, rank and signature of a bilinear form.
- determine a linear operator is normal, unitary and orthogonal projection and to construct the spectral decomposition of normal and self-adjoint operators.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-I)
COURSE CODE-MHMH- 414

COURSE TITLE:NUMBER THEORY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.

Time: 3Hrs — **MAXIMUM MARKS: 100**
Medium: English — **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-1

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

Unit-II

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

Unit-III

Quadratic residue modulo a prime, Euler's criterion, The Legendre symbol and its properties, Gauss Lemma, Quadratic reciprocity law, Jacobis symbol and its Properties, Pythagorean triplets, Insolvability of Diophantine equation $x^4 + y^4 = z^4$, $x^4 - y^4 = z^2$ in positive integers.

Unit-IV

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

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BOOKS PRESCRIBED:

1.David M. Burton: Elementary Number Theory, Mc Graw Hill 2002.

2.G.H. Hardy and E.M. Wright : An Introduction to the Theory of Numbers, Oxford University Press.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Form the bridge between pure mathematics and applied mathematics.
- Apply Number Theory in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- understand the various types of numbers and their properties.
- use various arithmetic functions and the concept of congruences to solve various arithmetic problems.
- Analyze the study of integers and integer-valued functions.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-I)
COURSE CODE-MHMH- 415
COURSE TITLE:COMPLEX ANALYSIS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

Time: 3Hrs **MAXIMUM MARKS: 100**
Medium: English **(Theory : 75**
Internal Assessment: 25)

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the properties of analytic functions, concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

BOOKS PRESCRIBED:

1. Copson, E.T .:Theory of functions of complex variables.
2. Ahlfors, D. V.:Complex analysis.

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3. Titchmarsh, E.C.:Theory of functions of a complex variable.
4. Conway, J.B.:Functions of one complex variable

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the properties of analytic functions.
- to understand the concept of poles, singularities, residues, contour integration and conformal mappings and their applications.

Khalsa College, Amritsar

(An Autonomous College)

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

COURSE CODE-MHMH- 416

COURSE TITLE: DIFFERENTIAL EQUATIONS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to express laws of nature with the help of differential equations.
- know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions.
- to focus on the equations and techniques most useful in science and engineering.
- Understand properties of solutions of differential equations is fundamental to much of contemporary science and engineering.
- learn to formulate, classify and transform first order partial differential equation into canonical forms.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-II)
COURSE CODE-MHMH- 421

COURSE TITLE:REAL ANALYSIS -II

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit I

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

Unit II

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

Unit III

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

Unit IV

Power series : Radius of convergence, properties, Abel's Theorem, Taylor's Theorem

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Fourier series :Convergence, Riemann Lebesgue Lemma, Bessel's inequality, Parseval's Equality.

BOOK RECOMMENDED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- studies the behavior of sequences and series of functions.
- familiar with the Riemann Stieltje's integral which is generalization of the Riemann integral.
- Analyzes the applications of Power series in the field of engineering i.e in spectrum analysis, radio, audio, and light applications.
- understand Riemann Stieltjesintegrability 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 Weierstrass Approximation Theorem .
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Syllabus for
PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)
(Semester-II)
COURSE CODE-MHMH- 422

COURSE TITLE:ADVANCED ALGEBRA

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To understand Principal Ideal domains, Euclidean Rings and Unique factorization domains.
- To study the Modules and Structure theorem of modules over PID's.
- To study the Torsion module, Torsion free modules, Nakayama lemma, Artinian and Noetherian modules.

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Prime ideals and maximal ideals in commutative rings, Nil radical, Jacobson radical, Operations on ideals, Extension and contraction of ideals, Nakayama lemma, Exact sequences of modules.

BOOKS PRESCRIBED:

1. Fraleigh, J. B.: A first course in Abstract Algebra 7th edition, Narosa Publishing House, New Delhi.
2. Singh ,S. and Zameeruddin ,Q.: Modern Algebra, Vikas Publishing House, New Delhi.

Chairperson, BoS in Mathematics

3. Dummit, D.S. & Foote, R.M. : Abstract-Algebra, John-Wiley & Sons, Students Edition-1999
4. Bhattacharya, P.B.,Jain, S.K., Nagpal, S.R. : Basic Abstract Algebra, Cambridge University Press, 1997.
5. Musili, C.: Rings and Modules, Narosa Publishing House, New Delhi, 1994.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use ring theory in wide areas of current research in mathematics, computer science and mathematical/theoretical physics.
- introduce themselves with the concepts and develop working knowledge on simple ring and ring homomorphism.
- know the structure of rings, their representations, modules, special classes of rings (group rings, division rings, and universal enveloping algebras).
- Deal with developments of commutative ring theory, which is a major area of modern mathematics.
- appreciate the significance of unique factorization in rings and integral domains.

Khalsa College, Amritsar

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

COURSE CODE-MHMH- 423

COURSE TITLE: PROBABILITY THEORY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

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BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- acquaint with the foundation of probabilistic and statistical analysis, mostly used in engineering and science like disease modeling, climate prediction networks etc.
- take informed decisions about a population by examining only a small random sample of the members of that population.
- quantify the uncertainty and assess the accuracy of our inference about the population.
- have good understanding of exploratory data analysis. Learner will be able to write a short-report describing a simple statistical data set.
- become informed consumer of statistical information provided in newspaper, magazine and journals.

Khalsa College, Amritsar

(An Autonomous College)

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

COURSE CODE-MHMH- 424

COURSE TITLE: CLASSICAL MECHANICS AND CALCULUS OF VARIATIONS

CREDIT HOURS(PER WEEK):6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

Variational problems with fixed boundaries, Transversality conditions, Orthogonality conditions, Sturm-Liouville's theorem on extremals, one sided variations, Hamilton's principle, The principle of least action, Langrange's equations from Hamilton's principle.

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Unit-IV

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

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- apply the classical mechanics approach to solve a mechanical problem.
- understand the concept of functional and determine stationary paths of a functional to deduce the differential equation for stationary paths.
- describe and understand the motion of a mechanical system using Lagrange Hamilton formalism.
- recognize the degrees of freedom and understand the concept of generalized coordinates.
- apply the concepts of classical mechanics in Geology, engineering, and many other inter-disciplinary areas.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME:M.Sc.Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE-MHMH- 425

COURSE TITLE: DIFFERENTIAL GEOMETRY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- The aim of this course is to get the students familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals, the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

COURSE CONTENT:

Unit – I

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

Unit – II

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

Unit-III

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

Unit-IV

Surfaces in R^3**:** Implicit and Explicit forms for the equation of the surface, the two fundamental forms of a surface, Family of surfaces, Edge of regression, Envelops, Ruled surface, Developable and skew surfaces, Gauss and Weingarten formulae.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- familiar with curvature and torsion of space curves, the relation of tangent planes, principle normals and binormals.
- know the intrinsic and non-intrinsic properties of surfaces and geodesics, tensors analysis and its applications.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc. Mathematics (under the Hons. Scheme)

(Semester-II)

COURSE CODE-MHMH- 426

COURSE TITLE: MATHEMATICAL METHODS

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- prepare themselves with mathematical tools and techniques that are required in advanced courses offered in the applied mathematics and engineering problems.
- apply concept of mathematical methods in diverse areas of science and technology such as electric analysis, communication engineering,solution of partial differential operation.
- learn to solve the Integral equations which are encountered in various problems including radiative transfer, and the oscillation of a string, membrane, or axle.
- Understand the concept of Laplace and Fourier Transforms and enable them to apply these for solving simultaneous, linear and partial differential equations.
- interpret the concept of Volterra and Fredholm integral equations and find solutions of these equations using various methods

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

Semester-III

COURSE CODE-MHMH- 531

COURSE TITLE: MEASURE THEORY

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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,
- It will give the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.

COURSE CONTENT:

Unit-I

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

Unit-II

The motivation behind Measurable Functions, various Characterizations and Properties of Measurable functions: Sums, Products and Compositions Sequential Pointwise Limits and Simple Approximations to Measurable Functions. Littlewood‟s three principles.

Unit-III

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-IV

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

BOOKS PRESCRIBED:

1. Royden,H.L and P.M. Fitzpatrik; Real Analysis (Fourth Edition), Pearson Education Inc.New Jersey, U.S.A (2010).
2. R.A. Gordon, The integrals of Lebesgue, Denjoy, Perron and Henstock, Amer. Math.Soc.

Province, RI, (1994).

3. Barra, G De: Introduction to Measure Theory, Van Nostrand and Reinhold Company.
4. Jain, P.K. ,Gupta, V.P. and Pankaj Jain : Lebesgue Measure and Integration, New Age International Publishers.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use concepts of mathematical analysis to determine the sizes of sets.
- Know about natural extension of Riemann integral which allows for better understanding of the fundamental relations between differentiation and integration.
- applyLebesgue integration in many areas, including Functional Analysis, Harmonic Analysis and Probability Theory.
- acquire the knowledge of Lebesgue measurable sets, measurable functions and Lebesgue integral.
- extend the concept of outer measure in an abstract space

Chairperson, BoS in Mathematics

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)
(Semester-III)
COURSE CODE-MHMH- 532

COURSE TITLE: FUNCTIONAL ANALYSIS-I

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- 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.
- To study the certain classes of functions defined in functional spaces.
- Students will learn the applications of Hahn- Banach theorem.

COURSE CONTENT:

Unit-I

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

Unit-II

Equivalent norms,Finite dimensional normed linear spaces and compactness, Riesz Lemma, The conjugate space N*.

Unit-III

The Hahn-Banach theorem and its consequences. The natural imbedding of N into N**, reflexivity of normed spaces.

Open mapping theorem, projections on a Banach space, closed graph theorem, uniform boundedness principle.

Unit-IV

Conjugate operators. L_P -spaces: Holder's and Minkowski,s inequalities, completeness of L_P-spaces.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the main concepts and fundamental methods of functional analysis to treat various concrete problems based on Banach spaces.
- study the certain classes of functions defined in functional spaces.
- learn the various examples of banach spaces.
- verify the requirements of a norm and completeness with respect to a norm.
- compute the spectrum of operators and classify the set into sub-classes.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)
(Semester-III)
COURSE CODE-MHMH-533

COURSE TITLE:STATISTICAL INFERENCE

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.

Time: 3Hrs **MAXIMUM MARKS: 100**
Medium: English **(Theory Marks: 60**
Internal Assessment Theory Marks: 20
Practical Marks: 15
Practical Internal Assessment Marks: 05)

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Point Estimation: Estimators, Properties of unbiasedness, consistency, sufficiency, efficiency, completeness. Methods of estimation: maximum likelihood estimator, properties of MLE(without proof), method of moments, Neyman factorization theorem, Minimum variance unbiased estimators.

Unit II

Rao Blackwell Theorem, Cramer-Rao lower bound. Concepts of testing of hypotheses, critical region, two types of errors, power function, level of significance, p-value. Neyman-Pearson Theorem, M.P. test, UMP test, Likelihood ratio property.

Unit-III

Applications of Sampling Distributions: Test of mean and variance in the normal distribution, Tests of single proportion and equality of two proportions, t-test, Chi-square test and F-test. Large sample tests.

Unit-IV

Linear Estimation: Gauss Markov linear models, BLUE, Gauss Markov Theorem, estimation with linear restrictions on parameters, residual sum of squares, Analysis of variance, Analysis of variance for one way and two way classified data with one observation per cell.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On successful completion of this course, students will be able to:

- Solve the problems based on estimation and to test the efficiency of various estimators.
- Handle the practical problems using hypothesis testing.
- Solve the practical problems using t-test, F-test, Z-test, chi-square test for various types of data.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-III)

COURSE CODE-MHMH- 534

COURSE TITLE: MECHANICS

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- The course is designed to introduce Newton's laws to particles and system of particles.
- The course introduces Kepler's laws and principles of central force motion.
- To aquaint the students with the applications of momentum principles to rigid bodies and system of rigid bodies.
- To understand the kinetics of the rigid bodies and solve simple problems using work-energy principles.

COURSE CONTENT:

UNIT-I

Newton's laws of motion, work, energy and power. Conservative forces, potential energy. Impulsive forces, Rectilinear particle motion:-(i) Uniform accelerated motion (ii) Resisted motion (iii) Simple harmonic motion. The cycloid and its dynamical properties (only).

UNIT-II

Motion of a particle under a central force, pedal- co- ordinates and equations. Kepler's laws of planetary motion and Newton's Law of gravitation, elliptic harmonic motion.

UNIT-III

Moments and products of Inertia, Theorems of parallel and perpendicular axes, Moment of inertia and momental ellipsoid, angular momentum of a rigid body about a fixed point and about fixed axes. Principal axes, Kinetic energy of a rigid body rotating about a fixed point in terms of moment of inertia, equimomental systems (uniform rod and triangular lamina).

UNIT-IV

General motion of a rigid body, linear momentum of a system of particles. Angular momentum of a system. Problems in two-dimensional rigid body motion, law of conservation of Angular momentum, illustrating the laws of motion, law of conservation of energy only.

Chairperson, BoS in Mathematics

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BOOKS RECOMMENDED:

1. Chorlton, F.: Text Book of Dynamics.
2. Elssgists, L.: Differential equations and the calculus of variations.
3. Gupta, A.S.: Calculus of Variation with Application. (PHI Learning Pvt. Ltd.)
4. Loney, S.L.: Dynamics of rigid body
5. Rutherford, D.E.:Classical Mechanics

COURSE OUCOMES: On completing the course, the students will be able to:

- .To apply Kepler laws in satellite motion.
- To apply knowledge of work energy principle to solve problems related to statics and dynamic equilibrium.
- To solve problems in two-dimensional rigid bodies using various energy and momentum laws.

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Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-III)

COURSE CODE-MHMH- 535

COURSE TITLE: DISCRETE MATHEMATICS

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- The course introduces basic operations and laws in Boolean Algebra.
- To aquaint the students with the foundations of grammars, languages and the general rules involved.
- To introduce generating functions and recurrence relations.

COURSE CONTENT:

Unit-I

Boolean algebra**:** Boolean algebra and its properties. Laws of Boolean Algebra, Principle of duality in Boolean algebra, Self-Dual Function, Uniqueness of complement in a Boolean Algebra. Atoms of a Booean Algebra. Stone's Representation Theorem. Boolean Expression, Equivalent Boolean Expressions, Boolean functions, Fundamental forms of a Boolean function. Sum of Product and Product of Sum canonical forms.

Unit-II

Recurrence relation and generating functions, Recurrsion, Non- Recurrsive definition of polynomial expression, recursive definition of polynom,ial expression (Telescopic form), closed form expression, Recurrence Relation, Linear recurrence relation from closed form expression, solution of Homogeneous Recurrence relation of order n, generating functions, solution of Recurrence relation using generating functions

Unit-III

Grammar and Languages: Strings, concatenation of Strings, Language , Concetenation of Languages, Phrase structure Grammar,Sentential forms, Language generated by grammar, regular, context free and context sensitive grammar and langauges.

Unit - IV

Connected Graphs and Trees: Walk, Path and Circuits, Euler Path and circuits, Acyclic Graph, Eulerian Graph, Subgraph, Connected and disconnected graphs. Trees and their properties. Directed tree, Rooted Tree, Binary Tree, spanning trees.

BOOKS PRESCRIBED:

1. Trambley, J.P. and Manohar,R: Discrete Mathematical Structures with Applications to

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Chairperson, BoS in Mathematics

Computer Science.
2. Liu C.L.: Elements of Discrete Mathematics.
3. Alan Doerr and Kenneth Leasseur: Applied Discrete Structures for Computer Science
4. Seymour Lipschutz: Discrete Mathematics, Schaum's outline series, Mc-Graw Hill Education.

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

- Formulate problems and solve recurrence relations.
- Model and solve real world problems usimg graphs and trees.
- Simplify Boolean expressions.

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Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-III)

COURSE CODE- MHMH-536(A)

COURSE TITLE- Applied Statistics

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To enhance skills to solve the problems based on birth rate, death rate, index numbers and time series.
- To exhibit proficiency in application of statistics to solve daily life problems.

COURSE CONTENT:

UNIT-I

Time series Analysis: Definition, utility, measurement of trend**:** Graphic Method, method of curve fitting by principle of least squares(excluding logistic curve).
Measurement of seasonal variations (only method of simple averages).

UNIT-II

Index numbers: Definition, uses, construction of index numbers, simple (unweighted) aggregate method, weighted aggregate method (Laspeyre's method, Paasche's method, Bowley's method, Fisher's method).
Quantity Index Numbers: Time reversal test, Factor(Volume) reversal test, base shifting.

UNIT-III

Vital Statistics: Uses, methods of obtaining vital statistics.
Measurement of Fertility: Crude Birth Rate**(**C.B.R.),General Fertility Rate(G.F.R.), Specific Fertility Rate (S.F.R.), Total Fertility Rate(T.F.R.).

UNIT-IV

Measurement of mortality: Crude Death Rate (C.D.R), Specific Death Rate (S.D.R.), Infant Mortality Rate (I.M.R.), Standardized Death Rate (**S.**D.R.) .

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand and Sons.
2. S. P. Gupta: Statistical Methods, Sultan Chand & Sons.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Analyze the trends using various methods such as graphic method and method of curve fitting.
- Construct index numbers with the help of Laspeyre's method, Paasche's method, Bowley's method, Fisher's method.
- Learn the methods of obtaining vital Statistics.
- Apply the knowledge of applied statistics to measure the mortality rate
- Calculate the total fertility rate and general fertility rate with the help of applied statistics.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)
(Semester-III)
COURSE CODE: MHMH-536(B)
COURSE TITLE: Project

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS:90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

COURSE OBJECTIVES:

- To get admission in Ph.D programmes and other higher studies in national and international universities.
- To acquint the students with research oriented work.
- It will help the students to enhance the knowledge of pure and applied mathematics.
- To work on various mathematical topics beyond the syllabus.
- To inculcate discussion abilities, flexibility of thought and effective time management in students.

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

COURSE OUTCOMES: after the completion of the course, students will be able to:

- develop presentation skills in the students.
- inculcate discussion abilities, flexibility of thought and effective time management in students.
- eligible for for admission in Ph.D programmes and other higher studies in national and international universities.
- acquint themselves with research oriented work.
- enhance the knowledge of pure mathematics.
- experience to face a panel in logical way.

Chairperson, BoS in Mathematics

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for
PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)
(Semester-IV)
COURSE CODE-MHMH- 541

COURSE TITLE: TOPOLOGY

CREDIT HOURS(PER WEEK): 6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**
Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Topological spaces, Continuous functions, Homeomorphisms, Countabilityaxioms, Product spaces and quotient spaces, Topological groups.

Unit-II

Connectedness, Intermediate value theorem and uniform limit theorem, Local connectedness,

Unit-III

Compactness, Finite Intersection Property (F.I.P.), Cantor‟s intersection theorem,, Uniform continuity, Bolzano-Weierastrass Property, Local compactness, Metrizable topological spaces, The Tychonoff Theorem.

Unit-IV

Separation axioms, Hausdorff spaces, Regular Spaces, Normal spaces, Urysohn's Lemma, Completely regular spaces, , Urysohn's Metrization Theorem, The Tietze extension theorem, Completely normal spaces.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending.
- discuss the shape of molecules in chemistry by analysis of the topology of a related graph.
- Understand the mathematical tools that are useful to applied mathematicians and to theoretical physicists.
- Apply the knowledge of topology in computers specially in network science.
- understand the various topological spaces and their properties, separation axioms, Tietz extension theorem and Tychnoff theorem.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-IV)

COURSE CODE-MHMH- 542

COURSE TITLE: FUNCTIONAL ANALYSIS-II

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- 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 Hilbert spaces.
- Students will study the conjugate spaces and their properties.
- Students will learn about compact linear operators and spectral theory.

COURSE CONTENT:

Unit -I

Inner product spaces, Hilbert spaces, orthogonal complements, orthonormal sets,

Unit-II

The conjugate space H*,Strong and weak convergence in finite and infinite dimensional normed linear spaces. Weak convergences in Hilbert spaces, weakly compact set in Hilbert spaces.

Unit-III

The adjoint of an operator, self adjoint operators, positive operators, normal operators, Unitary operators. Projections on a Hilbert space.

Unit-IV

Spectral Theorem for normal operators, Compact linear operators on normed spaces, properties of Compact linear operators.

BOOKS PRESCRIBED:

1. Simmon G.F.:Introduction to topology and Modern Analysis Ch.X (sections 52-59) Ch. XI (Sections

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the main concepts and fundamental methods of functional analysis to enable a student to treat various concrete problems based on Hilbert spaces .
- Study functional spaces which play vital role in study of existence and uniqueness of solutions of differential equations, boundary value problems, optimization techniques etc.
- distinguish between Banach spaces and Hilbert spaces.
- classify operators into self-adjoint, unitary and normal operators.
- represent a bounded linear functional in terms of inner product.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-IV)

COURSE CODE-MHMH- 543

COURSE TITLE: FIELD EXTENTIONS AND GALOIS THEORY

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- To understand the concept of finite and infinite fields.
- To get familiar with various field extensions such as simple extension, separable extensions etc.
- To learn the formation of finite fields.
- To get familiar with Galois Theory.

COURSE CONTENT:

Unit-1

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

Unit –II

Algebraic closure, Algebraically closed fields.Finite fields, Existence of GF(p^n), Construction of finite fields, Separable and purely inseparable extensions, Perfect fields.

Unit-III

Simple extentions, Primitive elements, Lagrange"s theorem on primitive elements ,Normal extentions, Roots of unity. Galois extensions, The Fundamental theorem of Galois theory.

Unit-IV

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

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSEOUTOCMES: On **successful completion of this course, students will be able to:**

- Deal with the problems based on finite and infinite fields.
- Detect the simple field, splitting field, perfect field etc.
- Have an idea of splitting field of a given polynomial.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-IV)

COURSE CODE-MHMH- 544

COURSE TITLE: OPERATIONS RESEARCH-II

CREDIT HOURS(PER WEEK):6
TOTAL HOURS: 90 hrs.
MAXIMUM MARKS: 100

Time: 3Hrs | **(Theory : 75**
Medium -English | **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- In this course basic concepts of Queuing theory and its generalized models are introduced.
- The course explains inventory control and inventory models for specific situations in an organization.
- The course is designed to introduce characteristics of single server/multi servers queuing models with limited and unlimited capacity.
- The course is designed to give detailed description of replacement problems, mortality theorems and simulation models.

COURSE CONTENT:

Unit-I

Queueing Theory: Introduction, Queueing System, elements of queueing system, distributions of arrivals, inter arrivals, departure service times and waiting times. Classification of queueing models, Queueing Models**:** (M/M/1) :(∞/FIFO), (M/M/1) :(N/FIFO), Generalized Model: Birth- Death Process, (M/M/C) :(∞/FIFO), (M/M/C) :(N/FIFO).

Unit-II

Inventory Control: The inventory decisions, costs associated with inventories, factors affecting Inventory control, Significance of Inventory control, economic order quantity (EOQ), Deterministic inventory problems without shortage and with shortages, EOQ problems with price breaks, Multi item deterministic problems.

Unit-III

Replacement Problems: Replacement of equipment/Asset that deteriorates gradually, replacement of equipment that fails suddenly, Mortality Theorem, recruitment and promotion problem, equipment renewal problem.

Unit-IV

Simulation: Need of simulation, methodology of simulation. Simulation models, event- type simulation, generation of random numbers, Monte Carlo simulation. Simulation of inventory problems, queueing system, Maintenance problems and job sequencing.

BOOKS PRESCRIBED:

1. R.Panneerselvam: Operations Research
2. Taha, H.A.: Operations Research
3. Chaddrasekhara, Rao & Shanti Lata Mishra: Operations Research
4. Kanti Swarup, Gupta, P.K. & Man Mohan: Operations Research
5. Mustafi, C.K.: Operations Research Methods & Practice.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Study the Operations Research for the purpose of making better decisions.
- learn about management and administration of socio-cultural behavior and economic factors that exist as bottleneck to effective implementation.
- analyze complex real life problems typically with the goal of improving or optimizing performance .
- develop more effective approaches to programming by using different queuing models,generalizedmodels,power supply model etc., customer's preference relating to the size,colour packaging
- determine the size of the stock to meet the future demand by applying inventory control methods,replacement problems

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-IV)

COURSE CODE: MHMH- 545

COURSE TITLE: Sampling Theory

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS

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

COURSE OBJECTIVES:

- To aquaint the students the theoretical as well as practical knowledge of field study to analyze the data, interprete the result and draw valuble conclusion coming from various aspects.
- To make students familiar with the implementation of various samplying schemes along with their merits, demerits and comparisons in appropriate practical situations.
- The course introduce methods of sample selection estimation, samplying variance, standard error of estimation in finite population, development of sampling theory for use in sample survey problems and sources of errors in survey.

COURSE CONTENT:

Unit-I

Concepts of population and sample, census versus sample surveys, parameter, estimator, mean square error, properties of best estimator, principle steps in sample survey, principles of sample surveys, concepts of probability and non-probability sampling. Introduction to Simple random Sampling (Use of lottery Method, Random Numbers and pseudo random numbers).

Unit-II

Simple random sampling(With or without replacement): Unbiased estimator of population mean, variance of estimator of population mean and unbiased estimator of variance of estimator of population mean, covariance between two sample means under simple random sampling with and without replacement. estimation of population proportion and variance of these estimators.

Unit-III

Estimation of sample size based on specified coefficient of dispersion and confidence interval for population mean , concept of stratified population and stratified sample, estimation of population mean based in stratified sample. Expectation and variance of estimator of population mean assuming SRSWOR within strata.

Unit-IV

Proportional Allocation, Optimum Allocation (Neymann Allocation) with and without varying cost, comparison of simple random sampling and stratified random sampling with proportional and optimum allocations.

BOOKS PRESCRIBED:

1. Sukhatme P.V., Sukkhatme P.V., Sukhatme S. & Ashok C. (1997): Sampling Theory of Surveys and Applications-Piyush Publications.
2. Des Raj and P.Chandok (1998): Sample Survey Theory. Narosa Publishing House.
3. Wiliam G. Cochran (1977): Sampling Techniques, 3rd Edition-John Wiely & Sons.
4. Parimal Mukhopadhyay (1988): Theory and Methods of Survey Sampling-Prentice Hall of India Pvt. Ltd.
5. Murthy M.N. (1977): Sampling Theory of Methods-Statistical Publishing Society, Culcutta

COURSE OUTCOMES: On completing the course, the students will be able to:

- Learn the fundamental concepts of population and sample.
- Understand the principles of sample survey and the steps involved in selecting a sample.
- Compare Simple Random Sampling and Stratified Sampling.
- Practical applications of proportional and optimal allocation
- Understand properties of unbiased estimators of population mean and variance.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME:M.Sc.-Mathematics (under the Hons. Scheme)

(Semester-IV)

COURSE CODE: MHMH-546

COURSE TITLE: Special Functions

CREDIT HOURS(PER WEEK): 6

TOTAL HOURS: 90 hrs.

MAXIMUM MARKS: 100

Time: 3Hrs **(Theory : 75**

Medium -English **Internal Assessment: 25)**

INSTRUCTIONS FOR PAPER SETTERS:

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

COURSE OBJECTIVES:

- To have an idea about the concept of Legendre, Bessel, Hermite polynomial.
- To study the properties of special functions.

COURSE CONTENT:

Unit-I

Hypergeometric Series, Hypergeometric equations, Hypergeometric Functions, Linear relationships of Hypergeometric functions, Confluent Hypergeometric equation and function, Simple properties of Confluent hypergeometric function.

Unit-II

Legendre's Differential equation: Series solution of Legendre Differential equation.
Legendre Function of first kind: The formulae of Murphy and Rodrigues, Orthogonal properties, Recurrence formulae.
Legendre's function of second kind: polynomials, Recurrence formulae. Relation between Legendre's function of first kind and second kind.

Unit-III

Bessel's Differential equation: Series solution.
Bessel's function of first kind: Rodrigue's formula, Recurrence formulae, Orthogonal properties.
Bessel's function of second kind: The modified Bessel's function, The Ber and Bei functions.

Unit-IV

Hermite's differential equation, series solution, The Hermite polynomials, Rodrigue's formula, Recurrence formulae, Orthogonal properties.
Laguerre differential equation, series solution, Laguerre polynomials, Orthogonal properties, Recurrence formulae.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

1. I. N. Sneddon: Special Functions of Mathematical Physics and Chemistry, Edinburg, Oliver & Boyd, 1956.
2. G. Andrews, R. Askey & R. Roy, Special Functions, Cambridge, 1999.
3. L. Andrews, Special Functions for Engineers and Applied Scientists, Macmillan, 1985.
4. N. N. Lebedev, Special Functions & Their Applications, Revised Edition, Dover, 1976.
5. W. W. Bell, Special Functions for Scientists and Engineers, Dover, 1968.

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

- Explain the various mathematical methods.
- To solve the various mathematical problems beyond the syllabus.

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2025

Programme Code: MAT

Programme Name: B.A. /B.Sc.

(Semester I- VI)

Examinations: 2022-2025

Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

S.No.	PROGRAMME OBJECTIVES
1.	
2.	
3.	
4.	
5.	

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	
PSO-2	
PSO-3	
PSO-4	
PSO-5	

SCHEME OF COURSE B.A./B.SC.

(SUBJECT MATHEMATICS)

Semester-I

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT-111A	Algebra	38	12	50	60
2.	MAT-111B	Calculus and Trigonometry	37	13	50	60

Semester-II

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT-121A	Calculus and Differential equations	38	12	50	60
2.	MAT-121B	Calculus	37	13	50	60

Semester-III

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT-231A	Analysis	38	12	50	60
2.	MAT-231B	Analytical Geometry	37	13	50	60

Semester-IV

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT-241A	Statics and Vector Calculus	38	12	50	60
2.	MAT-241B	Solid Geometry	37	13	50	60

Academic Session 2022-23

Semester-V

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT -351A	Dynamics	38	12	50	60
2.	MAT -351B	Number Theory	37	13	50	60

Semester-VI

Sr. No.	Course Code	Course Title	Theory Max. Marks	Internal Assessment in Theory	Max. Marks	Hrs.
1.	MAT-361A	Linear Algebra	38	12	50	60
2.	MAT-361B	Numerical Analysis	37	13	50	60

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–I

MATHEMATICS

COURSE CODE: MAT-111A

COURSE TITLE: Algebra

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 hrs.

Time: 3 Hours **MAXIMUM MARKS: 50**

Medium: English **(Theory Marks: 38**

Internal Assessment: 12)

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section–A will consists of eight compulsory questions, each of one mark.
3. The Section–B, C, D& E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Students will be able to solve problems based on matrix algebra, vector spaces, eigen values and eigen vectors, Cardon's and Descarte's methods of solving a system of equations and inequalities.

COURSE CONTENT:

Unit-I

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

Unit-II

Eigen values, Eigen vectors, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field.

Unit-III

Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Matrix Congruence of skew–symmetric matrices. Reduction in the real field. Classification of real quadratic forms in variables. Definite, semi–definite and indefinite real quadratic forms. Characteristic properties of definite, semi–definite and indefinite forms.

Unit-IV

Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations and symmetric function of roots, Descarte's rule of signs, Newton's Method of divisors, Solution of cubic equations by Cardan method, Solution of biquadratic equations by Descarte's and Ferrari's Methods.

BOOKS PRESCRIBED:

1. K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002).

Chairperson, BoS in Mathematics

2. H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.
3. Chandrika Parsad: Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.

COURSE OUTCOMES: On completing the course, the students will be able to:

- solve problems based on matrices, vector spaces, eigen values and eigen vectors,
- recognize consistency and inconsistency of linear equations.
- Understand the relation between roots and coefficients.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–I

MATHEMATICS

COURSE CODE:MAT-111B

COURSE TITLE: Calculus and trigonometry

CREDIT HOURS(PER WEEK): 4

TOTAL HOURS: 60 HRS.

MAXIMUM MARKS: 50

Medium: English **(Theory Marks: 37**

Time: 3 Hours **Internal Assessment: 13)**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section–A will consists of SEVEN compulsory questions, each of one mark.
3. The Section–B, C, D& E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Calculus has widespread applications in science, economics, and engineering and can solve many problems for which algebra alone is insufficient.
- Trigonometry is a branch of mathematics that studies relationships between side lengths and angles of triangles.
- Students will apply calculus and Trigonometry in areas such as geodesy, surveying, celestial mechanics, and navigation.
- Students will learn relationships to other branches of mathematics, in particular complex numbers, infinite series, logarithms and calculus.

COURSE CONTENT:

Unit-I

Real number system and its properties, lub, glb of sets of real numbers, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuity.

Unit-II

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

Unit-III

De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses.

Unit-IV

Exponential and Logarithmic function of complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

BOOKS PRESCRIBED:

1. N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.
2. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad.

Chairperson, BoS in Mathematics

3. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.
4. Shanti Narayan and P.K. Mittal: Differential Calculus, S Chand & Company.
5. Shanti Narayan and P.K. Mittal: Real Analysis, S Chand & Company.
6. Rajinder Pal Kaur:Calculus, First world Publication, Ludhiana.

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the relationships between side lengths and angles of triangles.
- understand Calculus as a major part of contemporary mathematics education.
- Have knowledge in applications in science, economics, and engineering and students can solve many problems for which algebra alone is insufficient.
- Calculate the limit and examine the continuity of a function at a point.
- Develop intricate relationships to other branches of mathematics, in particular complex numbers, infinite series, logarithms and calculus.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–II

MATHEMATICS

COURSE CODE: MAT-121A

COURSE TITLE: Calculus and differential equations

CREDIT HOURS(PER WEEK) : 4
TOTAL HOURS: 60 HRS
MAXIMUM MARKS: 50

Medium: English **(Theory Marks: 38**

Time: 3 Hours **Internal Assessment: 12)**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. The Section–A will consists of eight compulsory questions, each of one mark.
3. The Section–B, C, D& E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Calculus is a branch of mathematics focused on limits, functions, derivatives, integrals, and infinite series.
- 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.

COURSE CONTENT:

Unit-I

Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple Points, Curvature, Tracing of Curves (Cartesian and Parametric coordinates only).

Unit-II

Integration of hyperbolic functions. Reduction formulae. Definite integrals. Fundamental theorem of integral calculus. Quadrature, rectification.

Unit-III

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's Form and singular solutions. Geometrical meaning of a differential equation. Orthogonal Trajectories.

Unit-IV

Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series Method, Bessel and Legendre equations (only series solution).

BOOKS PRESCRIBED:

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

India, 1961.
4. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
5. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.
6. Shanti Narayan and P.K. Mittal: Integral Calculus, S Chand & Company

COURSE OUTCOMES: On completing the course, the students will be able to:

- acquaint with the limits, functions, derivatives, integrals, and infinite series.
- associate Differential equations with the Mathematical modeling.
- solve multifarious differential equation that relates functions with its derivatives.
- know about concavity and convexity of the functions, Asymptotes and multiple points of a curve.
- Have knowledge about applications in fields of engineering, physics, economics, and biology.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–II

MATHEMATICS

COURSE CODE: MAT-121B

COURSE TITLE: Calculus

CREDIT HOURS (PER WEEK) : 4
TOTAL HOURS: 60 hrs.
MAXIMUM MARKS: 50

TIME: 3Hrs **(THEORY: 37**
MEDIUM: English **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of SEVEN compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem, Statements of Inverse and implicit function theorems and applications.

Unit-II

Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and saddle points of functions of two Variables.

Unit-III

Lagrange's undetermined multiplier method. Double and Triple Integrals, Change of variables, Change of order of integration in double integrals.

Unit-IV

Applications to evaluation of Areas, Volumes, Surfaces of solid of revolution.

BOOKS PRESCRIBED:

1. Narayan, S. & **Mittal**, P.K. : Integral Calculus, S. Chand & Co.
2. Kreyszig, E.: Advanced Engineering Mathematics.

Chairperson, BoS in Mathematics

3. Narayan S. & Mittal, P.K. : Differential Calculus, S. Chand & Co.

COURSE OUTCOMES: On completing the course, the students will be able to:

- apply Calculus in various fields such as computer graphics, physical sciences, economics and engineering.
- use Calculus in oceanography to calculate the height of tides in oceans.
- understand concept of partial derivatives which are used in fields such as computer graphics, physical sciences, vector calculus and engineering.
- learn about evaluating double and triple integrals of functions of several variables and apply them in evaluating area and volume of solids.
- Understand the concepts of jacobians, maxima and minima of functions of two variables, envelopes and evolutes.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–III

MATHEMATICS

COURSE CODE: MAT-231A

COURSE TITLE: Analysis

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS : 60 HOURS

MAXIMUM MARKS: 50

TIME: 3Hrs **(THEORY : 38**

Medium: English **INTERNAL ASSESSMENT: 12)**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of eight compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

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

COURSE CONTENT:

Unit-I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.

Unit-II

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-III

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.

Unit-IV

Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.

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BOOKS PRESCRIBED:
1. Malik, S.C & Arora, Savita.: Mathematical Analysis, Wiley Eastern Ltd. (1991).
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974).
3. Narayan, S & Mittal, P.K.: Integral Calculus, S. Chand & Co.

COURSE OUTCOMES: On completing the course, the students will be able to:
- Study the behavior of real numbers, sequences and series of real numbers.
- Test the convergence of sequences and series of various types, the convergence of improper integrals.
- Apply the concept of Riemann integrability, the use of beta and gamma functions in solving various problems of calculus.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)
SEMESTER–III MATHEMATICS
COURSE CODE: MAT-231B
COURSE TITLE: Analytical geometry

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

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of SEVEN compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Analytic geometry is a branch of mathematics that enable the students in understanding and applying the concepts of geometry in the daily life.
- Some of such applications of geometry in different fields are art, robotics, Computer, and video games, architecture, Astronomy and physics, geographic information systems, and also in the construction of stairs making the use of angles of geometry.
- Helps to understand the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions.
- The properties of conics (parabola, ellipse, hyperbola and sphere) are also to be studied.

COURSE CONTENT:

Unit-I

Transformation of axes in two and three dimensions: Shifting of origin, Rotation of axes, The invariants, Joint equation of pair of straight lines, equations of bisectors.

Unit-II

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-III

Ellipse and hyperbola with their properties. Tangents and normals, Pole and polar. Pair of tangents at a point, Chord of contact.

Unit-IV

Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Identifications of curves represented by second degree equation (including pair of lines). 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.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

1. Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry.
2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London.
3. Narayan, S. & Mittal, P.K.: Analytical Solid Geometry, S. Chand & Co.
4. Kreyszig, E.: Advanced Engineering Mathematics, John Wiley & Sons.
5. Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand and apply the concepts of geometry in the daily life.
- analyse the applications of geometry in different fields such as art, robotics, Computer, and video games.
- realize the important role of Analytical Geometry in architecture and also in the construction of stairs by making use of angles.
- comprehend the concepts of change of origin, rotation of axes and invariants for second degree equations in two and three dimensions.
- know about the properties of conics (parabola, ellipse, hyperbola and sphere).

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–IV MATHEMATICS

COURSE CODE: MAT-241A

COURSE TITLE: Statics and vector calculus

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS : 60 HOURS

MAXIMUM MARKS: 50

Medium: English **(THEORY : 38**

Time: 3 Hours **INTERNAL ASSESSMENT: 12)**

Instructions for the Paper Setters:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2.The Section–A will consists of eight compulsory questions, each of one mark.
3.The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4.Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the resolution and composition of a number of forces.
- Students will understand 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.
- Studenst will learn the differentiation and integration of vector functions, properties of gradient, divergence and curl, the applications of Gauss divergence theorem, Stoke’s theorem and Green’s theorem.

COURSE CONTENT:

Unit-I

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

Unit-II

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-III

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, Vector integration,

Unit-IV

Theorems of Gauss, Green, Stokes and problems based on these.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the study of system of forces in equilibrium and differentiation and integration of vector functions.
- define the resolution and composition of a number of forces, parallel forces and couples, moments of forces and couples about a point and a line.
- generalise the theory behind the friction and centre of gravity.
- apply concept of a vector integration in a plane and in space.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–IV

MATHEMATICS

COURSE CODE:MAT-241B

COURSE TITLE: PAPER–II: Solid geometry

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS : 60 HOURS

MAXIMUM MARKS: 50

Medium: English **(THEORY : 37**

Time: 3 Hours **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of seven compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- It will help students to generalise the concepts and ideas of plane geometry.
- It will give students the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure.
- Students will understand its applications in 3-D modelling, Architectural designing, 3-D Computer graphics.
- This subject will make the students to understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

COURSE CONTENT:

Unit-I

Cylinder as surface generated by a line moving parallel to a fixed line and through a fixed curve. Different kinds of cylinders such as right circular, elliptic, hyperbolic and parabolic in standard forms

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.

Unit-III

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.

Unit-IV

Surfaces represented by general equation of 2^{nd} degree S = 0. Tangent lines, tangent planes and Normal plane.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand the concept of 3-D Euclidean geometry.
- generalise the concepts and ideas of plane geometry.
- Understand the basic geometric views of shape, size, length, angle, volume, surface area, rotation, translation, location etc. associated with any figure.
- learn about the applications of solid geometry in 3-D modelling, Architectural designing, 3-D Computer graphics.
- understand the concepts and properties of solids like cone, right circular cone, cylinder, right circular cylinder and sphere.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

SEMESTER–V MATHEMATICS

COURSE CODE MAT-351A

COURSE TTILE: PAPER–I: Dynamics

CREDIT HOURS (PER WEEK): 4

TOTAL HOURS : 60 HOURS

MAXIMUM MARKS: 50

Medium: English **(THEORY : 38**

Time:3hrs **INTERNAL ASSESSMENT: 12)**

Instructions for the Paper Setters:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of eight compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

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

COURSE CONTENTS:

Unit–I

Rectilinear motion in a straight line with uniform acceleration, Newton's laws of motion. Motion of two particles connected by a string.

Unit-II

Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit–III

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum.

Unit-IV

Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

BOOKS PRESCRIBED:

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

COURSE OUTCOMES: On successful completion of this course, students will be able to :

- Handle the problems based on rectilinear motion.
- Use Newton’s laws of motion in numerical problems.

- Deal with problems based on variable acceleration.
- Use concepts of work, power and energy to solve practical problems.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

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

MATHEMATICS

SEMESTER–V

COURSE CODE: MAT-351B

COURSE TITLE: PAPER–II: Number theory

CREDIT HOURS (PER WEEK) : 4

TOTAL HOURS: 60 Hours

MAXIMUM MARKS: 50

Medium: English **(THEORY : 37**

Time:3hrs **INTERNAL ASSESSMENT: 13)**

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of seven compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVES:

- Number theory is a branch of pure mathematics devoted primarily to the study of integers and integer-valued functions.
- Number theory have countless applications in mathematics as well in practical applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- The content of this course is designed to make the students understand the various types of numbers and their properties, various arithmetic functions, the concept of congruences to solve various arithmetic problems, G.C.D. and L.C.M. of numbers and the relation of linear Diophantine equations and congruences

COURSE CONTENTS:

Unit–I

Preliminaries: Proof by induction, Binomial Theorem. Divisibility in Integers: Basic Definitions and Properties, The division Algorithm, GCD, The Euclidean Algorithm, LCM, Existence and determination of solution to the linear Diophantine equation $ax + by = c$, primes-definition & Properties, the fundamental theorem of Airthmetic.

Unit-II

Number-theoretic functions: the greatest integer function, Euler's Phi-function, Sum & number of divisors functions, Mobius function & the Inversion formula.

Unit–III

Congrunces-definition and properties, linear congruences, existence & solution of the linear congruence, $ax \equiv b \pmod{m}$, Complete and reduces residue systems, Chinese remainder theorem.

Unit-IV

Fermat's theorem, Euler's theorem, Pseudoprimes Wilson;s theorem. Application to Cryptpgraphy- Factorization methods due to Fermat, RSA**.**

BOOKS PRESCRIBED:

1. D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope inChapters 2-5, 7-12), 2005.
2. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.
3. Tom M. Apostol, An introduction to Analystical Number Theory, Springer-Verlag, UTM.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Know about some fascinating discoveries related to properties of prime numbers.
- Interpret the concept of divisibility and fundamental theorem of Arithmetic.
- Have knowledge about applications such as security system like in banking securities, coding theory, barcodes and memory management systems.
- Understand the various types of numbers and their properties, various arithmetic functions.
- Understand concept of G.C.D. and L.C.M. of numbers and the relation of linear Diophantine equations and congruences will help to solve various arithmetic problems.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: B.A./B.Sc. (Semester System) (12+3 System of Education)
MATHEMATICS
SEMESTER–VI
COURSE CODE: MAT-361A
COURSE TITLE: PAPER–I: Linear algebra

CREDIT HOURS (PER WEEK): 4
TOTAL HOURS: 60 hrs.
MAXIMUM MARKS: 50
TIME: 3 Hours **(THEORY: 38**
MEDIUM: English **INTERNAL ASSESSMENT: 12)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of eight compulsory questions, each of one mark.
3. The Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OUTCOMES:

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

COURSE CONTENTS:

Unit–I

Definition of groups, rings and fields with examples. Definition of a vector space, subspaces with examples. Direct sum of subspaces. Linear span, Linear dependence, Linear independence of vectors. Linear combination of vectors.

Unit-II

Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis.
Invariance of the number of elements of the basis set.
Dimension of sum of two subspaces. Quotient space and its dimension.

Unit–III

Linear transformation. Algebra of linear transformation. Rank- Nullity theorem, Isomorphism and Isomorphic spaces.

Unit-IV

Matrix of a linear transformation. Changes of basis, Linear operator.

BOOKS PRESCRIBED:

1. K.Hoffman & R. Kunze: Linear Algebra, 2nd Edition, Prentice Hall, New Jersey, 1971.
2. V. Krishnamurthy, V. P. Mainra and J.L. Arora: An Introduction to Linear Algebra, East West Press, 1976.
3. Shanti Narayan & P.K. Mittal: A Text Book of Matrices, 10th Edition (2002), S.Chand & Co.
4. Surjit Singh: Linear Algebra, 1997.

COURSE OUTCOMES: On successful completion of this course, students will be able to :

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

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

MATHEMATICS

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

SEMESTER–VI

MATHEMATICS

COURSE CODE: MAT-361B

COURSE TITLE: Numerical analysis

CREDIT HOURS (PER WEEK):4

TOTAL HOURS:60 hrs.

MAXIMUM MARKS: 50

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

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

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Sections–B, C, D & E from Unit-I, II, III& IV, respectively.
2. The Section–A will consists of seven compulsory questions, each of one mark.
3. Each Section–B, C, D & E will consist of two questions each. Students are to attempt any five questions in total by selecting at least one question from each section. Each question carries 6 marks.
4. Teaching time for this paper would be six periods per week.
5. Use of Non-programmable scientific calculator is allowed.

COURSE OBJECTIVES:

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

COURSE CONTENTS:

Unit–I

Error generation, propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Iteration method, Newton's Method, Generalized Newton's Method, Method of false position, Muller's method, Rate of convergence of these methods. Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi’s Method, Gauss Seidel Method.

Unit-II

Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator.

Unit–III

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,

UNIT-IV

Gaussian integration method, Gaussian legendre integration. Double numerical integration. Numerical solution of ordinary differential equations, Initial value problem, Taylor's method, Euler's methods, Picard's method, Milne's Method, Runge-Kutta Method. Predictor- Corrector's Method.

BOOKS PRESCRIBED:

1. S.S. Sastry: Introductory Methods of Numerical Analysis, 2003 (3rd Edition), Prentice Hall of India.
2. A. Maritava Gupta and Subash Ch. Bose: Introduction to Numerical Analysis.

COURSE OUTCOMES: On completing the course, the students will be able to:

- understand the use of Numerical analysis in detecting errors in numerical calculations.
- solve linear and non-linear equations, in numerical differentiation and integration, to solve differential equations.
- have the knowledge of the study of algorithms that use numerical approximation for the problems of mathematical analysis.
- apply numerical analysis in all the fields of engineering, physical sciences, life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.
- Analyze and evaluate the accuracy of common numerical methods.

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2025

Programme Code: STA

Programme Name: B.A

(Semester I- VI)

Examinations: 2022-2025

Department of Mathematics

Khalsa College, Amritsar

Chairperson, BoS in Mathematics

S.No.	PROGRAMME OBJECTIVES
1.	
2.	
3.	
4.	
5.	

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	
PSO-2	
PSO-3	
PSO-4	
PSO-5	

Scheme of course B.A.
(Subject Statistics)

Semester-I

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA-111A	Statistical Methods–I	26	09	35	60
2.	STA -111B	Probability Theory	26	09	35	60
3.	STA -111P	Practical based on Paper: Statistical Methods-I	22	08	30	45

Semester-II

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA -121A	Statistical Methods–II	26	09	35	60
2.	STA -121B	Probability Distributions	26	09	35	60
3.	STA -121P	Practical based on Paper: Statistical Methods-II and Probability Distributions	22	08	30	45

Semester-III

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA -231A	Advanced Probability-I	26	9	35	60
2.	STA -231B	Statistical Inference-I	26	9	35	60
3.	STA -231P	Practical based on Paper: Statistical Inference-I	22	8	30	45

Semester-IV

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA -241A	Advanced Probability-II	26	9	35	60
2.	STA -241B	Statistical Inference-II	26	9	35	60
3.	STA -241P	Practical based on Paper: Statistical Inference-II	22	8	30	45

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Semester-V

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA -351A	Linear Models and design of experiments	26	9	35	60
2.	STA -351B	Theory of Sample Surveys	26	9	35	60
3.	STA -351P	Practical based on Paper: Linear Models and design of experiments	22	8	30	45

Semester-VI

Sr. No.	Course Code	Course Title	Max. Marks	Internal Assessment	Total	Hrs.
1.	STA -361A	Economic Statistics	26	9	35	60
2.	STA -361B	Vital Statistics and industrial statistics	26	9	35	60
3.	STA -361P	Practical based on Papers: Economic Statistics & Vital Statistics and industrial statistics	22	8	30	45

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-I

COURSECODE: STA-111A

COURSE TITLE: PAPER–I: Statistical methods–I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will learn the meaning and scope of Statistics.

COURSE CONTENTS:

Unit-I

Meaning and scope of statistics, Collection of data, presentation of data, diagrammatic representation of data. Attributes and variables, discrete and continuous frequency distribution of a variable, graphical representation of frequency distribution of a variable.

Unit-II

Central tendency: Measures of central tendency, namely, Arithmetic mean, median, mode, Geometric mean, Harmonic mean and their comparisons with an ideal measure of central tendency.

Unit-III

Dispersion and its measures, range, mean deviation, quartile deviation and standard deviation. Advantages of standard deviation as measure of dispersion over the other measures, Relative measures of dispersion, coefficient of variation.

Unit-IV

Central and non–central moments, central–moments expressed in terms of moments about an arbitrary origin and vice-versa. Sheppard's correction for moments. Skewness and its measures, Kurtosis and its measures.

BOOKS PRESCRIBED:-

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.
2. Croxton F.E., Cowden, D.J. and Kelin, S. (1973): Applied General Statistics, Prentice Hall of India.
3. Goon, A.M. Gupta, M.K. and Dasgupta B.: Fundamentals of Statistics, Vol. I, World Press, 2005.

BOOKS SUGGESTED FOR SUPPLEMENTARY READING:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B.: Basic Statistics, World Press, 2005.
2. Gupta, S.C.: Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to solve Statistical problems using various measure of central tendency.
- collect the data and present it diagrammatically.
- Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
- apply the statistical methods in various fields such as finance, marketing, accounting and business.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
B.A. (Semester System) (12+3 System of Education)
Semester-I
COURSE CODE: STA-111B

COURSE TITLE: PAPER–II: Probability Theory

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

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**
Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will acquaint themselves with the foundation of probabilistic analysis.
- It will enable the students to quantify the uncertainty and assess the accuracy of our inference about the population.
- Students will have good understanding of exploratory data analysis

COURSE CONTENTS:

Unit-I

Random experiments, sample space, events, mutually exclusive and exhaustive events, algebra of events, various definitions of the probability, axiomatic probability function and its properties.

Unit-II

Finite sample spaces; equally likely outcomes, additive law of probability, conditional probability, multiplicative law of probability, independent events. Baye's Theorem and its applications.

Unit-III

Random variable, examples of random variables, Discrete and continuous random variables, probability mass function and density function, cumulative distribution function, Properties of distribution function of discrete and continuous random variables. Real valued functions of one dimensional random variables and the procedures of finding the Probability Distributionsfunctions of such functions illustrated by examples.

Unit-IV

Expected value of a random variable and of functions of one dimensional random variable. Properties of expected values. variance of random variable and its properties. Moment generating function and its properties.

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007
3. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Use statistics in engineering and science like disease modeling, climate prediction networks etc.
- to quantify the uncertainty and assess the accuracy of our inference about the population.
- have good understanding of exploratory data analysis.
- learn the concept of random variable, expected value and moment generating function of random variable.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-I

COURSE CODE: STA-111P

COURSE TITLE: Practical based on PAPER: Statistical methods–I

CREDIT HOURS (PER WEEK): 3

TOTAL HOURS:45 hrs.

MAXIMUM MARKS: 30

(Practical Marks: 22

Time: 2 Hours **Internal Assesment Practical: 08)**

MEDIUM: English

INSTRUCTION FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and another one is external). This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:-

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10

COURSE OBJECTIVES:

- Students will be able to solve Statistical problems using various measure of central tendency.
- It enables the students to collect the data and present it diagrammatically.
- Students will solve problems related to measure of dispersion.

COURSE CONTENT:

Teaching time for practical paper would be two period per week.

List of practical exercises:

1. Exercises on presentation of Data
2. Exercises on measurers of central tendency
3. Exercises on measures of dispersion
4. Exercises on calculation of moments
5. Exercises on measures of Skewness
6. Exercises on measures of Kurtosis

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to solve Statistical problems using various measure of central tendency.
- collect the data and present it diagrammatically.
- Use Statistics in research for proper characterization, summarization, presentation and interpretation of the result of research.
- apply the statistical methods in various fields such as finance, marketing, accounting and business.

Chairperson, BoS in Mathematics

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-II

COURSE CODE: STA-121A

COURSE TITLE: Statistical methods – II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Medium: English **Theory Internal Assessment: 09)**

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will use Method of association and contingency table to find the independence of the attributes.

COURSE CONTENT:

UNIT-I

Bivariate data, scatter diagram, covariance, Karl–Pearson's correlation coefficient and its properties, calculation of correlation coefficient from grouped data, bounds of the correlation coefficient, interpretation of the value of the correlation coefficient.

UNIT-II

Spearman's rank correlation coefficient, The principle of least squares, fitting of straight line, polynomials, exponential, logarithmic curve.

UNIT-III

Regression lines, relation between correlation coefficient and regression coefficients.

UNIT-IV

Independence and association of attributes, measures of association,contingency table.

BOOKS PRESCRIBED:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:-

1. Goon, A.M. Gupta, M.K. and Dasgupta B., Basic Statistics, World Press, 2005.
2. Gupta, S.C., Statistical Methods, Himalayan Publishing House, 2003.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.

COURSE OUTCOMES: On completing the course, the students will be able to:

- learn to establish linear association between two variables by using Correlation.
- find the best fit for a set of data points with the help of method of least square.
- use regression to predict the behavior of dependent variable.
- Use Method of association and contingency table to find the independence of the attributes.
- use statistical methods in the future prediction for various observations in different fields like Business Analysis, Artificial Intelligence, Financial Analysis, Fraud Detection, Share Market and Pharmaceutical Sector and other industries.

Khalsa College, Amritsar

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Syllabus for
PROGRAMME: B.A. (Semester System) (12+3 System of Education)
Semester-II
COURSE CODE: STA-121B

COURSE TITLE: Probability Distributions
CREDIT HOURS (PER WEEK):4
TOTAL HOURS: 60 hrs
Medium: English **MAXIMUM MARKS: 35**
Time: 3 Hours **(Theory Marks: 26**
Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will apply the Probability Distributionsin real life situations such as Business Analysis, Artificial Intelligence, Financial Analysis, Fraud Detection etc.
- Students will realize difference between discrete and continuous distributions.
- Students will know about distributions to study the behavior of two random variables

COURSE CONTENT:

Unit–I

Discrete Distributions: Uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution, Poisson distribution as limiting form of Binomial distribution, Fittings of Binomial and
Poisson distributions,

Unit–II

Geometric distribution, Pascal distribution and Hyper geometric distribution. Properties, expected value, variance and moment generating functions of these distributions.

Unit–III

Continuous Distributions: Normal distribution, Fitting of normal distribution, Exponential distribution, Uniform distribution.

Unit–IV

Gamma distribution, Beta distribution. The properties of these distribution including their expected values, variances and moment generating functions

BOOKS PRESCRIBED:-

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Hogg. R.V., Mcken, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.

Books Suggested for Supplementary Reading:-

1. Biswal, P.C., Probability and Statistics, Prentice Hall, India, 2007.
2. Ross, S.A. First Course in Probability, Sixth Edition, Pearson Education, 2007.
3. Miller, I, and Miller, M. Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- to differentiate discrete and continuous distributions.
- know about distributions to study the behavior of two random variables.
- study the discrete distributions such as Bernoulii, Binomial, Poisson etc.
- Learn about Continuous distributions such as Exponential, Normal, uniform etc. will be studied in this course.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

Semester-II

COURSE CODE: STA-121P

COURSE TITLE: Practical based on PAPER Statistical methods–II and Probability distributions

CREDIT HOURS (PER WEEK):3

Medium: English **TOTAL HOURS: 45 hrs**

Time: 2 Hours **MAXIMUM MARKS: 30**

(Practical Marks: 22

Internal Assesment Practical: 08)

INSTRUCTION FOR PAPER SETTER:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the principal of the college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10
4. Teaching time for practical paper would be two period per week per paper.

COURSE OBJECTIVES:

- Students wil understand to find the best fit for a set of data points with the help of method of least square.
- It enables the students to use correlation and regression to predict the behavior of dependent variable.
- Students will realize difference between discrete and continuous distributions.

COURSECONTENT:

List of practical exercises

1. Exercises on calculation of Karl Pearsons correlation coefficient
2. Exercises on calculation of Spearman's rank correlation coefficient
3. Exercises on fittings of regression lines, polynomials, exponential and logarithmic curves.
4. Exercises on fittings of Binomial, Poisson and Normal Distributions
5. Exercises on calculation of probabilities for Binomial, Poisson and Normal Distributions

COURSE OUTOCMES: On completing the course, the students will be able to:

- find the best fit for a set of data points with the help of method of least square.
- use regression to predict the behavior of dependent variable
- to differentiate discrete and continuous distributions.
- know about distributions to study the behavior of two random variables.
- study the discrete distributions such as Bernoulii, Binomial, Poisson etc.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231A

COURSE TITLE: PAPER–I: Advanced probability-I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 35**

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will study the moments of bivariate probability distributions
- Students will learn about distributions to study the joint behavior of two random variables.
- Students will learn to compute expectation, covariance and correlation coefficients.
- It will enable the students to have good understanding of exploratory data analysis.

COURSE CONTENT:

Unit–I

Two dimensional random variables, their joint probability mass function and joint probability density function, marginal and conditional Probability Distributionsfunctions, Independent random variables.

Unit–II

Expected value of real valued function of two-dimensional random variables, variance of a linear combination of random variables, Moments of Bivariate Probability distributions, Bivariate moment generating function.

Unit–III

Conditional expectation and conditional variance, Covariance, correlation coefficient. Cauchy Schwartz Inequality and its applications

Unit–IV

Bivariate normal distribution, marginal and conditional probability distributions associated with the bivariate normal distribution. Chebyshev's inequality and its applications.

BOOKS PRESCRIBED:

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Ross, S.A., First Course in Probability, Pearson Education, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.
3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Study the moments of Bivariate probability distributions
- learn about distributions to study the joint behavior of two random variables.
- Learn to compute expectation, covariance and correlation coefficients
- Learn the applications of Cauchy Schwartz Inequality and Chebyshev’s inequality

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231B

COURSE TITLE: PAPER–II: Statistical inference–I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 35**

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- To enable the students to develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- To help the students to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

COURSE CONTENT:

Unit–I

Point estimation, estimator and estimates, criteria for good estimators, unbiasedness, consistency, efficiency and sufficiency (only the definitions and examples).

Unit–II

Minimum variance unbiased estimator, Methods of estimation: moments and maximum likelihood method of estimation.

Unit–III

Interval estimation. Interval estimate of the mean of a normal distribution, Neyman and Pearson's theory of testing hypothesis, the concepts of statistical hypothesis, two types of errors, critical region, significance level.

Unit-IV

Power and power function, Most powerful test, The Neyman Pearson theorem (only the statement) and its applications for testing a simple hypothesis against a simple alternative.

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol.I & II, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand Different methods of finding point estimators for unknown population parameters, their advantages and disadvantages .
- Learn Desirable properties of point estimators based on which estimators can be compared.
- Apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- Develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- Learn to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231P

COURSETITLE:Practical based on paper Statistical inference–I

CREDIT HOURS (PER WEEK): 3

Medium: English **TOTAL HOURS: 45 hrs**

Time: 2 Hours **MAXMIUM MARKS: 30**

(Practical Marks: 22

Internal Assesment Practical: 08)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10

COURSE OBJECTIVES:

- To make the students aware about the practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- To enable the studenst to draw inferences about the unknown population parameters based on random samples.
- To help the students to solve exercises on method of estimators, types of error, critical region , significance level.

COURSE CONTENT:

Teaching time for practical paper would be one hour per week.

List of practical exercises:

1. Exercises on unbiased, consistent, efficient and sufficient estimators
2. Exercises on methods of estimation
3. Exercises on interval estimation
4. Exercises on two types of errors, critical region, significance level,
5. Exercises on Most powerful test.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- Drawing inference about the unknown population parameters based on random samples
- Validating our estimation/ inference about the population using hypothesis testing.
- Solve exercises on method of estimators, types of error, critical region , significance level.
- Practice the question based on most powerful test.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241A

COURSE TITLE: PAPER–I: Advanced probability-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to understand the concept of sampling distributions and their applications in statistical inference
- To help the studenst to learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.

COURSE CONTENT:

Unit–I

Concept of statistics, sampling distribution and standard error, Sampling distributions: Chisquare, t and F distributions and their applications.

Unit–II

Sampling distribution of the mean of a set of independent random observations from a normal population, sampling distribution of the sample variance of independent random observations from a normal population (derivation of sample variance distribution is excluded). Expectation and variance of sampling mean and variance.

Unit–III

The law of large numbers, Bernoulli's form of the law of large numbers, Convergence in probability, the difference between convergence in probability and the ordinary convergence of calculus, convergence in distribution.

Unit–IV

The central limit theorem for independent identically distributed random variables and the outline of its proof using moment generating function. Applications of central limit theorem. Normal approximation to the Binomial distribution, Poisson distribution.

BOOKS PRESCRIBED:

3. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
4. 2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Ross, S.A., First Course in Probability, Pearson Education, 2007.
3. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSEOUTCOMES: On completing the course, the students will be able to:

- To understand the concept of sampling distributions and their applications in statistical inference
- Learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.
- Analyze categorical data by using Chi square techniques.
- Understand the laws of convergence and their inter relations

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241B

COURSE TITLE: PAPER–II: Statistical Inference-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- To allow the students to compare the two univariate normal distributions through their mean and variance.
- To help the students to apply Z test to check the significance of correlation coefficient, single proportion.
- To help the students to learn the applications of chi square test such as goodness of fit, independence of attributes

COURSE CONTENT:

Unit-I

A Large Sample Tests: Tests about the mean and variance of a univariate normal distribution, comparison of two univariate normal distributions through their means and variances.

Unit-II

Testing the significance of the correlation coefficient. Tests for significance for single proportion and for difference of two proportions, Z-transformation of the sample correlation, tests regarding the population correlation coefficient based on the Z-transformation. Chi-square tests for goodness of fit.

Unit-III

Chi-square test for homogeneity and for independence of attributes, simplified formula for Chi-square for testing homogeneity and for independence in 2x2 tables and axb contingency tables. Yates correction for continuity in 2x2 tables. Chi-square tests for significance for single variance. F-test for equality of variances.

Unit-IV

Small Sample Tests: t-tests for single population and two populations, paired t-test, t-test for significance of correlation coefficients and regression coefficients,

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. II, World Press, 2005.
3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTOCMES: On completing the course, the students will be able to:

- have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- Compare the two univariate normal distributions through their mean and variance.
- Apply Z test to check the significance of correlation coefficient, single proportion.
- Learn the applications of chi square test such as goodness of fit, independence of attributes
- Use the t- test for checking the significance of single population and double population.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241P

COURSE TITLE: Practical based on paper Statistical inference–II

CREDIT HOURS (PER WEEK):3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10

Teaching time for practical paper would be one hour per week.

COURSE OBJECTIVES:

- To help the students to understand the practical applications of large and small sample tests.
- To draw the inference about the unknown population parameters based on various tests.
- To enable the students to validate the significance of hypothesis using various tests.

COURSE CONTENT:

List of practical exercises

1. Exercises on Large Sample Tests
2. Exercises on Z-transformation
3. Exercises on applications of Chi square test
4. Exercises on applications of t - test
5. Exercises on application of F – test

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of large and small sample tests.
- Drawing inference about the unknown population parameters based on various tests.
- Validate the significance of hypothesis using various tests.
- Solve exercises on Z transformation.
- Practice the question based on application of Chi square test.

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KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351A

COURSE TITLE: PAPER–I: LINEAR MODELS AND DESIGN OF EXPERIMENTS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Linear models, the fixed effect models, the distribution of minimum error sum of squares and the conditional minimum error sum of squares, tests of general linear hypotheses. Analysis of one way classified data under the fixed effect model expectations of various mean sum of squares in one way classified data.

SECTION–B

Analysis of two way classified data with one observation per cell under the fixed effect models, Analysis of two way classified data with multiple but equal observation in cell under the fixed effect models, expectations of various mean sum of squares in two way classified data.

SECTION–C

Terminologies in experimental designs, basic principles of design of experiment: randomization, replication and local control, completely randomized design, randomized block design and the latin square design, balanced incomplete block design and their advantages, disadvantages and analysis.

SECTION–D

Factorial experiments, the concept of main effects and interactions in and factorial experiments and the sum of squares due to them. Yates method of computing the sum of squares due to the main effects and interactions in and factorial designs, statistical analysis of these experiments (excluding confounding).

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamentals of Statistics, Vol. II, World Press, 2005.
2. Das, M.N. and Giri, N.C. Design and Analysis of Experiment, New Age International Publisher, 2003.
3. Gupta, S.C. and Kapoor, V.K,. Applied Statistics, Sultan Chand and Company, 2007.

KHALSA COLLEGE, AMRITSAR

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351B

COURSE TITLE: PAPER–II: THEORY OF SAMPLE SURVEYS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Introduction to design of sample surveys, census and sample surveys, basic principles of sample surveys, planning a sample survey, sampling and non sampling errors. Simple random sampling (WR and WOR) and its results, estimation of mean: its mean and variance and its estimate.

SECTION–B

Estimation of proportion: its mean and variance, stratified random sample (WOR): estimation of mean: its mean and variance and its estimate (under WOR), proportional. Neyman and optimum allocations.

SECTION–C

Ratio, product and regression estimates of population mean: their approximated (under large sample) expected values and variances under SRSWOR, comparisons with mean per unit estimate (under SRSWOR)

SECTION–D

Regression estimates of population mean: their approximated (under large sample) expected values and variances under SRSWOR, comparisons with mean per unit estimate (under SRSWOR)

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamentals of Statistics, Vol. II, World Press, 2005.
2. Singh, D. and Chaudhary, F.S., Theory and Analysis of sample survey design, New Age International Publisher, 2002.
3. Mukhopadhyar, P., Theory and Methods of Survey Sampling, Prentice Hall, 2000.
4. Gupta, S.C. and Kapoor, V.K,. Applied Statistics, Sultan Chand and Company, 2007

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KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351P

COURSE TITLE: PAPER-III: - Practical based on PAPER–I: LINEAR MODELS AND DESIGN OF EXPERIMENTS

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CREDIT HOURS (PER WEEK):3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

Teaching time for practical paper would be one hour per week.

List of Practicals Exercises 1. Exercises on analysis of variance for one way classified data and Completely Randomized design

2. Exercises on analysis of variance for two way classified data with one observation per cell and Randomized Complete Block design

3. Exercises on analysis of variance for two way classified data with multiple but equal observations per cell

4. Exercises on analysis of variance for Latin Square design

5. Exercises on analysis of variance for Balanced Incomplete Block design

6. Exercises on analysis of variance for 2 and 2 factorial experiments

Students are required to prepare a practical note book with at least 15 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 10
3. Exercises: 15

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361A

COURSE TITLE: PAPER–I: ECONOMIC STATISTICS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Introduction to index number, problems in the construction of index numbers, Laspyeres, Passche's, Drobish-Bowley, Walsh Marshal-Edgworth and Fisher's formulae for index numbers.

SECTION–B

Errors in index numbers, various tests for the criterion of a good index numbers, chain index number, cost of living index numbers, uses of index numbers.

SECTION–C

Introduction of time series, the four components of a time series, measurement of secular trend by graphic method, method of semi averages, the method of moving averages and fitting of mathematical curves.

SECTION–D

Measurement of seasonal fluctuations by method of simple averages, ratio to moving average, ratio to trend and link relative methods, measurement of cyclical fluctuations (excluding periodogram analysis).

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B., Fundamentals of Statistics, Vol.-II, World Press, 2005.
2. Medhi, J., Statistical Methods. New Age International Publishers, 2000.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.
4. Gupta, S.C. and Kapoor, V.K., Applied Statistics, Sultan Chand and Company, 2007.

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361B

COURSE TITLE: PAPER–II: VITAL STATISTICS AND INDUSTRIAL STATISTICS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

Medium: English

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Vital statistics, data for vital statistics, rate of vital events, measurement of mortality, crude, specific and standardized death rates, cause of death, infant Mortality. Fertility rates. Measurement of fertility.

SECTION–B

Crude birth rate, general fertility rate, age specific fertility rate, general and total fertility rates. Measurement of population growth, growth reproduction rate and net reproduction rate.

SECTION–C

Statistical quality control: chance and assignable causes, process and product control, the techniques of control charts for process control, three sigma limits and specification limits. Schewharts Control charts for mean, S.D. and Range, Control Chart for number of defective and fraction defective, control charts for number of defects.

SECTION–D

Advantages of process control, sampling inspection by attributes for product control, the concept of producer's and consumer's risks, AQL, LTPD, AOQL, ASN, ATI and OC functions and curves, single and double sampling plans and their properties.

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B., Fundamentals of Statistics, Vol.-II, World Press, 2005.
2. Medhi, J., Statistical Methods. New Age International Publishers, 2000.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.
4. Gupta, S.C. and Kapoor, V.K., Applied Statistics, Sultan Chand and Company, 2007.

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KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361P

COURSE TITLE: PAPER-III: - Practical based on PAPER–I: ECONOMIC STATISTICS and PAPER–II: VITAL STATISTICS AND INDUSTRIAL STATISTICS

CREDIT HOURS (PER WEEK): 3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

Teaching time for practical paper would be one hour per week.

List of practical exercises 1. Exercises on construction of index numbers: Laspyere's, Passche's, Drobish-Bowley's, Walsh Marshal-Edgworth's, Fisher's

2. Exercises on measurements of secular trend using graphic method, semi averages method, curve fitting method and moving average method

3. Exercises on fitting of various mathematical curves using least square principle

4. Exercises on measurements of seasonal fluctuations using simple average method, ratio to trend method, ratio to moving averages, and link relative method

5. Exercises on measurements of mortality: crude death rate, specific death rate, standardized death rate

6. Exercises on measurements of fertility: crude birth rate, general fertility rate, specific fertility rate, total fertility rate 7. Exercises on measurements of population growth: Crude rate, gross reproduction rate, net reproduction rate

8. Exercises on construction of three sigma limits of control charts for mean, standard deviation, and range

9. Exercises on construction of three sigma limits of control charts for number of defective, fraction defective, and number of defects.

Students are required to prepare a practical note book with at least 15 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 10
3. Exercises: 15

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2024

Programme Code: MST

Programme Name: M. Sc. Statistics
(Semester I- II)

Examinations: 2022-2024

Department of Mathematics

Khalsa College, Amritsar

(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

S.No.	PROGRAMME OBJECTIVES
1.	To enhance problem solving skills and develop logical thinking.
2.	To exhibit proficiency in application of statistics to solve daily life problems.

S.No.	PROGRAMME SPECIFIC OUTCOMES (PSOS)
PSO-1	understand basic theoretical and applied principles of statistics with adequate preparation to pursue a PhD or enter the job force as an applied statistician.
PSO-2	demonstrate technical and technological skills based on Statistical methods to meet the growing demand in the industrial, marketing, communication sectors.

M. Sc. Statistics

(Two year Course)
Scheme of Course

Semester-I

Code	Title of paper/subject	Theory Max. marks	Internal Assessment Theory	Practical max. marks	Assessment in Practical	Total	Hrs.
MST 101	Probability Theory -I	75	25	-	-	100	90
MST 102	Statistical Methods	75	25	-	-	100	90
MST 103	Linear Algebra & Numerical Analysis	75	25	-	-	100	90
MST 104	Object Oriented Programming Using 'C++'	56	19	18	07	100	90
MST 105	Computer Oriented Statistical Practicals -I	75	25	-	-	100	90
Total		356	119	18	07	500	450

Semester-II

Code	Title of paper/subject	Theory Max. marks	Internal Assessment Theory	Practical max. marks	Assessment in Practical	Total	Hrs.
MST 201	Probability Theory-II	75	25	-	-	100	90
MST 202	Statistical Inference-I	75	25	-	-	100	90
MST 203	Sampling Theory	75	25	-	-	100	90
MST 204	Demography & Vital Statistics	75	25	-	-	100	90
MST 205	Computer Oriented Statistical Practicals -II	75	25	-	-	100	90
	Total	375	125	-	-	500	450

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Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Statistics

(Semester-I)

COURSE TITLE: PROBABILITY THEORY-I

COURSE CODE: MST-411

CREDIT HOURS:6

TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**
Medium: English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each **(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- Concept of probability
- Basics of discrete distributions and know their properties
- Basics of continuous distributions and know their properties

COURSE CONTENT:

UNIT-I

Random Experiment: Trial, Sample Point and Sample Space, Events, Operations on Events; Definition of Probability : Classical, Relative Frequency and Axiomatic Approach; Properties of Probability Function based on Axiomatic Approach; Combinatorial Problems, Addition Theorem, Conditional Probability, Multiplication Theorem.

UNIT-II

Independence of Events, Bayes Theorem; Random Variable: One & Two Dimensional Random Variable, Distribution Function of a Random Variable, Discrete and Continuous Random Variables and their Probability Distributions, Marginal and Conditional Distributions associated with a two Dimensional Distribution. Independence of Random Variables, Expectation of a Random Variable, Moments (Raw & Central) & their inter-relationship.

UNIT-III

Generating Functions : Probability Generating Functions & Moment Generating Functions; Study of Various Discrete Distributions: Rectangular, Hyper Geometric, Binomial, Poisson, Negative Binomial , Geometric, Multinomial .

UNIT-IV

Study of Various Continuous Distributions: Uniform, Normal, Gamma, Beta, Exponential, Laplace, Cauchy, Bivariate Normal Distribution and its Marginal and Conditional Distributions. Sampling Distribution, Mean and Standard Error of a Sampling Distribution. Derivation of the Sampling Distributions of Chi. Square, T, F (Null Case Only), Sample Mean and Sample Variance for Sampling from a Normal Population and their Properties.

TEXT BOOKS

1. Meyer, P.L. Introductory Probability and Statistical Applications, 2017 Oxford & IBH publishing , 2nd Edition.
2. Gun, A.M., Gupta, M.K. and Dasgupta, B. — An Outline of Statistical Theory. Vol. I, 2016, 3rd ed. World Press.

REFERENCE READINGS

1. Rohatgi, V.K. and Saleh Ehsanes Md. A. K. — An introduction to Probability theory and Mathematical Statistics, 3rd Edition, Wiley Eastern Ltd, 2015
2. Gupta, S.C. and zKapoor, V.K. — Fundamentals of Mathematical Statistics, 2014 Sultan Chand and Sons, 4th Edition

COURSE OUTCOME: On completion of the course the learner should be able to:

- comprehend the concept of probability and random variables.
- understand the properties and uses of various discrete distributions (Rectangular, Hyper Geometric, Binomial, Poisson, Negative Binomial, Geometric, Multinomial).
- understand the properties and uses of various continuous distributions (Normal, Gamma, Beta, Exponential, Laplace, Cauchy, Bivariate Normal Distribution).

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: M.Sc. Statistics
(Semester-I)

COURSE TITLE: STATSTICAL METHODS
COURSE CODE: MST-412

CREDIT HOURS:6
TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**
Medium: English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each **(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- To introduce the technique of data collection and its presentation.
- To emphasize the need for numerical summary measures for data analysis.

COURSE CONTENT:

UNIT-I

Basic concepts of Statistics, Concepts of central tendency, dispersion, skewness and kurtosis and their respective measures upon quantiles and moments, Sheppard's correction for moments.

UNIT-II

Bivariate data : Concept of Correlation, regression and errors in regression, Coefficient of correlation & its properties, coefficient of determination, Principle of least square, fitting of linear regression & related properties.

UNIT-III

Multivariate data : Multiple linear regression, Partialand Multiple correlation. Correlation ratio, rank correlation and intra-class correlation. Categorical data: Basic concepts, consistency of data, independence & association of attributes, various measures of association.

UNIT-IV

Concept of fixed effect model, Analysis of variance for one way, two way classification with equal and unequal number of observations per cell under the fixed effects models. Assumptions and applications of t, chi-square, F and Z statistics. Large samples test for means, proportions, goodness of fit and independence of attributes in contingency tables.

TEXT BOOKS

1.	Gun, A.M., Gupta M.K., Dasgupta, B.	Fundamentals of Statistics. Vol. 1. 2016, World Press. Calcutta.
2.	Gupta, S.C. and Kapoor, V.K.	Fundamentals of Mathematical Statistics, **2019**. Sultan Chand and Sons, 4th Edition.
3.	Freund J.E.	Mathematical Statistics, Prentice Hall Of India,2001.

COURSE OUTCOMES: On completion of the course the learner should be able to:
1. use various techniques of data collection and presentation.
2. understand different summary measures of location (averages) used for data analysis and the basis for their selection.
3. choose appropriate methods to present data.
4. select and calculate appropriate averages to represent data sets
5. use of statistical tools to carry out elementary categorical data analysis.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Statistics

Semester-I

COURSE TITLE: LINEAR ALGEBRA AND NUMERICAL ANALYSIS

COURSE CODE: MST-413

CREDIT HOURS:6

TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**

Medium: English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each**(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- To understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
- To get familiar with Quotient space, Direct sum, linear span and linear independence.
- To understand the concept of Rank and nullity of linear transformations.
- To relate matrices and linear transformations
- The content of this course is designed to make the students understand the use of: Bi-section method, Regula-falsi method, and Newton-Raphson method
- It will help the students to understand the difference between Difference and shift operators
- It enable the students to solve linear and non-linear equations, in numerical integration.

COURSE CONTENT:

UNIT-I

Fields, Vector Spaces: Linear dependence and independence, Basis and dimension of a vector space, examples of vector spaces. Linear transformations, row and column spaces of a matrix, elementary matrices, determinant, rank and inverse of a matrix, null space and nullity.

UNIT-II

Orthogonal Transformations and Orthogonal matrix, Gram-Schmidt Orthogonalisation process, characteristic roots and characteristic vectors, Diagonalization of a matrix, triangular form of a matrix, Real quadratic forms, reduction and classification of quadratic forms .

UNIT-III

Difference and shift operators, identities involving separation of symbols and differences of zero, Newton's forward and backward interpolation formulae and estimation of the missing terms. Divided differences, Newton's and Lagrange's interpolation formulae for unequal intervals.

UNIT-IV

Solution of Transcendental and polynomial equations: Bi-section method, Regula-falsi method, Newton-Raphson method, Secant method. Numerical Integration : Simpson's one-third and three eighth & Weddle's formulae. Solution to simultaneous linear and Algebraic equations : Gauss elimination method, pivoting, ill-conditioned equations, Gauss-Seidal iterative method.

TEXT BOOKS

1. Hadley,G — Linear Algebra, **Addison Wesley, 2002**.
2. Saxena. H.C. — Calculus of Finite differences and Numerical Analysis, S Chand and Co., New Delhi, IXth Ed, **2010.**
3. B.S. Grewal — Numerical Methods, Khanna Publishers, **2015**.

REFERENCE READINGS

1. Bala Guruswamy : Computer Oriented Numerical Methods, **McGraw Hill Education, 2017.**
2. B. D. Gupta : Numerical Analysis, Konark Pub. Ltd., 2001.

COURSE OUTCOMES: On completing the course, the students will be able to:

- have the knowledge of the study of algorithms that use numerical approximation for the problems of mathematical analysis.
- apply numerical analysis in all the fields of engineering, physical sciences, life sciences, social sciences, medicine, business and even the arts have adopted elements of scientific computations.
- check the linear independence of vectorsand Form the linear combination of vectors.
- find the matrix corresponding to a linear transformation and vice versa.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: M.Sc. Statistics (Semester-I)

COURSE TITLE: Object Oriented Programming Using 'C++'
COURSE CODE: MST-414

TOTAL HOURS: 90 hrs
Time: 3Hrs **MAXIMUM MARKS:100**
Medium: English **(Theory: 56**
Internal Assesment Theory Marks:18
Practical Marks:19
Medium : English **Practical Internal Assesment Marks: 07)**
INSTRUCTIONS FOR PAPER SETTERS:

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1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each**(each question should be sudivided into atmost two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 11 marks.
4. Teaching time for this paper would be six periods per week.

COURSE OBJECTIVE:

The learning objectives of this course are:

1. To understand how C++ improves C with object-oriented features.
2. To learn how to design C++ classes for code reuse.
3. To learn how to implement copy constructors and class member functions.
4. To understand the concept of data abstraction and encapsulation.
5. To learn how to overload functions and operators in C++.
6. To learn how containment and inheritance promote code reuse in C++.
7. To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
8. To learn how to design and implement generic classes with C++ templates.

COURSE CONTENT:

UNIT-I

Evolution of OOP, OOP Paradigm, Advantages of OOP, Comparison between Functional Programming and OOP Approach, Characteristics of Object Oriented Language-objects, Classes, Inheritance, Reusability, User defined Data Types, Polymorphism , Overloading.

Introduction to C++ , Identifier and keywords, Constants, C++ Operators, type conversion, Variable declaration, statements, expressions, features of iostream.h and iomanip.h, input and output, conditional expression loop statements, breaking control statements.

UNIT-II

Defining a function, types of functions, storage class specifiers, recursion, pre- processor, header files and standard functions, Arrays, pointer arithmetic's, structures, pointers and structures, unions, bit fields typed, enumerations.

UNIT-III

Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors, inline member functions, static class member, friend functions, dynamic memory allocation.

Inheritance, single inheritance, types of base classes, types of derivation, multiple inheritance, container classes, member access control.

UNIT-IV

Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions, opening and closing of files, stream state member functions, binary file operations, structures and file operations, classes and file operations, random access file processing.

REFERENCES

1. Robert Lafore, "Object Oriented Programming in C++", Pearson Education India, 4th Edition, 2008.
2. D. Ravichandran, "Programming with C++", Edition, 2017.

COURSE OUTCOMES:

Course Outcomes:

Upon completion of this course, the students will be able to:

CO-1. Understand the difference between the top-down and bottom-up approach.

CO-2. Describe the object-oriented programming approach in connection with C++.

CO-3. Apply the concepts of object-oriented programming.

CO-4. Illustrate the process of data file manipulations using C++.

CO-5. Apply virtual and pure virtual function & complex programming situations.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: M.Sc. Statistics (Semester-I)

COURSE TITLE: COMPUTER ORIENTED STATISTICAL PRACTICALS –I

COURSE CODE: MST-415

TOTAL HOURS: 90 hrs
Time:3Hrs **MAXIMUM MARKS:100**
Medium:English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR THE PAPER-SETTERS

1. The paper will be set in two separate parts PART-A and PART-B .The setting and evaluation will be done by a Board of examiners consisting of Head (Chairman), External Examiners and Teacher (S) involved with the teaching of this paper.
2. PART-A of this paper will be set on the spot and will be of one and a half hours duration. This part will consist of two problems. The problems will be **based on theory papers COURSE CODE: MST411, COURSE CODE: MST 412 & COURSE CODE: MST 413** using Programming in "C++" or Statistical Software packages such as R, MINITAB , SPSS , STATGRAF, STATISTICA, etc.
3. PART-B of the paper will be of one and a half hours duration. This part will consist of FOUR questions **based on theory papers COURSE CODE: MST 411, COURSE CODE: MST 412 & COURSE CODE: MST 413** with at least one question from each of these papers. The candidates will be required to attempt any TWO questions using electronic device.
4. The division of marks out of a total of 75 and Minimum pass Marks, will be as follows :

Maximum Marks	75
Minimum pass Marks	30(40%)
Sessional work	15
Viva	12
Exercises based on Part A	20
Exercises based on Part B	28

COURSE OBJECTIVES:

- To understand the patterns in the data of large populations using Programming in "C++".
- To obtain the central location and dispersion of the data using s R language, SPSS, STATGRAF, STATISTICA.

COURSE CONTENT:

SYLLABUS DETAILS FOR PAPER-V (PRACTICAL)

PART-A: Programming in "C" Applying statistical software packages for problems based on Theory papers **COURSE CODE: MST 411, COURSE CODE: MST 412 & COURSE CODE: MST 413**

Use of Statistical Software packages such as MINITAB , SPSS , Statgraf etc.

PART-B: Practical Exercises for Statistical techniques based on topics in papers **COURSE CODE: MST 411, COURSE CODE: MST 412 & COURSE CODE: MST 413.**

RECOMMENDED READINGS

Stoodly. K.: Applied and computational Statistics, Ellis Howard.

COURSE OUTCOMES:

- Derive important statistical programme for moment generating function, joint probability mass functions, marginal densities, conditional distributions.
- Possess deeper understanding of the properties and uses of various computer languages to develop programme for discrete distributions and continuous distributions.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Statistics

(Semester-II)

COURSE TITLE: PROBABILITY THEORY–II

COURSE CODE: MST-421

TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**

Medium: English **(Theory :75**

Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each**(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- To understand the Graphical representation of distribution function.
- To understand the Moment inequalities.
- To know the relationship between Central Limit Theorems: De Moivre's –Laplace, Lindeberg-Levy, Liapounov and their applications.

COURSE CONTENT:

UNIT-I

Distribution functions, Decomposition of a distribution function into discrete, absolutely continuous and singular components. Graphical representation of distribution function. Distribution function of n-dimensional random variable, marginal and conditional distribution functions, independence of two or more sets of random variables. Product moments and moments of marginal and conditional distributions (conditional expectation and conditional variance)

UNIT-II

Moment inequalities : Cauchy-Schwarz and its extension, **Cr -** inequality, Holder- inequality, Minkowiski, Basic- inequality, Jensen inequality (statement only) Liapounov Inequality. Probability inequalities : Markov, Chebyshev and one sided Chebyshev. Various modes of convergence: in probability, almost sure, in distribution and in mean square and their inter-relationship .

UNIT-III

Law of Large Numbers : Weak Law of Large Numbers (Chebyshev's, Khinchin's, Bernoulli's & Poisson's). Kolmogorov SLLN (only statement). Characteristic function : Definition and its elementary property, Inversion and Uniqueness Theorem .

UNIT-IV

Continuity Theorem, necessary and sufficient condition for a function to be a characteristic function (only statement and applications). Central Limit Theorems: De Moivre's –Laplace, Lindeberg-Levy, Liapounov and their applications.

TEXT BOOKS

1. Gun,A.M., Gupta, M.K. I, and Dasgupta, B. An Outline of Statistical Theory. Vol. 2016 , 3rd Edition, World Press.
2. Bhat,B.R. Modern Probability theory : An Introductory Text Book, 2014, New Age International Private Limited.
3. Rohtagi V.K. and Saleh Ehsanes Md. A. K. An introduction to Probability theory and Mathematical Statistics, 3rd Edition, Wiley Eastern Ltd, 2015

REFERENCE READINGS

1. Chung, K.L. A Course in Probability theory, 2000, 3rd Edition, Academic Press.
2. Rao, C.R Linear Statistical Inference and its applications,
2009, 2nd Edition, Wiley Eastern.

COURSE OUTOCOMES:

- Derive important statistical functions of variables, moment generating function, joint probability mass functions, marginal densities, conditional distributions.
- Possess deeper understanding of the Distribution function of n- dimensional random variable, marginal and conditional distribution functions, and independence of two or more sets of random variables.
- Have a deeper understanding of the properties, uses and applications of Law of Large Number; know the central limit theorem and its applications.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Statistics

(Semester-II)

COURSE TITLE: STATISTICAL INFERENCE-I

COURSE CODE: MST-422

TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**

Medium: English **(Theory :75**

Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each**(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE: To study:

- Method of moments, method of maximum likelihood and also properties of ML estimator.
- Testing of hypotheses.
- Tests for the mean and variance of a Normal distribution.

UNIT-I

Problem of point estimation. Consistent estimators, Sufficient statistics. Neyman-Fisher Factorization theorem, unbiasedness and uniformly minimum variance unbiased estimator, Rao-Blackwell theorem, complete family of distributions . Lehman-Scheffe's theorem and its applications in finding UMVU estimators. Cramer-Rao inequality and most efficient estimator.

UNIT-II

Methods of Estimation: Method of moments, method of maximum likelihood (also properties of ML estimator), method of least squares and method of minimum chi-square and modified minimum chi- square.

UNIT-III

Concept of statistical hypothesis, simple and composite hypothesis, null and alternative hypothesis. Critical region, two types of errors, level of significance, size of the test, power and power function, Neyman-Pearson theory of testing of hypotheses: Neyman-Pearson fundamental lemma (existence and sufficient condition); Construction of most powerful (MP) and uniformly most powerful (UMP) tests using Neyman-Pearson lemma. MP, UMP and UMPU regions in random sampling from a Binomial, Poisson and Normal Exponential distributions, Definitions & Construction of type A and type A1 critical regions. Optimum regions and sufficient statistics, Randomized tests.

UNIT-IV

Composite hypothesis and similar regions, similar regions and complete sufficient statistics, Neyman structure, construction of most powerful similar regions. Tests for the mean and variance of a Normal distribution, Monotonicity, Consistency and invariance properties of a test. Likelihood ratio tests and their optimum properties. Confidence interval and confidence coefficient. General method of obtaining confidence limits, shortest confidence interval. Confidence interval for the parameters of univariate Normal and two independent Normal populations.

TEXT BOOKS

1.	Gun, AM.,Gupta, M.K. Dasgupta, B.	An Outline of Statistical Theory, Vol.II, The World press, Calcutta, 2013.
2.	Rohatgi, V.K. and Saleh Ehsanes Md. A. K.	An introduction to Probability theory and Mathematical Statistics, 3rd Edition, Wiley Eastern Ltd, 2015

REFERENCE READINGS

1. Lehman, E.L., Romano, J.P., Testing Statistical Hypotheses, Springer, 3rd Edition, 2008.
2. Lehman, E.L., Casella, G. Testing of point Estimation, Springer, 2nd Edition, 1998
3. Rao, C.R. Linear Statistical Inference and its Applications, Wiley Eastern, 2nd ed. 1994

COURSE OUTCOMES:

- Students are able to identify some basic Problem of point estimation, Consistent estimators and are cognizant of their properties.
- Students are knowledgeable about the Methods of estimation and uses.
- Students are knowledgeable in general about the concept of Composite hypothesis and similar regions.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: M.Sc. Statistics

(Semester-II)

COURSE TITLE: SAMPLING THEORY

COURSE CODE: MST-423

.

TOTAL HOURS: 90 hrs

Time: 3Hrs | **MAXIMUM MARKS:100**

Medium: English | **(Theory :75 Internal Assesment:25)**

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each **(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15 marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- Understand the techniques for data collection and its analysis.
- Understand the Need of Sampling, Planning and organization of a survey.
- Basic techniques of double sampling and Cluster sampling.

COURSE CONTENT:

UNIT-I

Basic concepts: Need of Sampling, Planning and organization of a survey, Sources of errors in surveys, non-response and measurement errors, Ordered and unordered sampling designs, Sampling scheme, procedure of selecting a sample, Estimator and its desirable properties and Sampling strategy, Horvitz-Thompson estimator, its variance and unbiased estimator of the variance.

Simple random sampling (SRS) with and without replacement: Estimation of various parameters for quantitative and qualitative characteristics; estimation of sample size for specified precision.

UNIT-II

Stratified random sampling (StRS): Arbitrary, proportional and optimum allocations, relative precision of stratified and simple random sampling, stratified sampling for proportions, Effect of deviations from the optimum allocation, construction of strata, estimation of gain due to stratification, estimation of variance with one unit per stratum.

Bivariate Population under SRS: Estimation of covariance and the ratio of two means (or totals), Estimation of mean using auxiliary information: usual ratio, product, regression and unbiased ratio type estimator of Hartley and Ross and approximate expressions for variances and biases, condition for its being BLUE. Double sampling: Ratio and regression methods of estimation of mean.

UNIT-III

Bivariate Population under StRS: Estimate for the ratio of two means (or totals), ratio and regression estimates of mean in stratified sampling and their comparison.

Systematic sampling (excluding circular systematic sampling): Estimation of population mean, and its application to structured populations.

Cluster sampling: Equal clusters and its efficiency relation between the variance of the mean of a single cluster and its size, Jesson's cost function and determination of optimum sampling unit. Sampling with unequal clusters, estimator of the means and their variances.

UNIT-IV

Two stage sampling: With equal first stage units, estimator of the population mean and its variance, optimum allocation for fixed cost, comparison with one stage sampling.

Unequal probability sampling with and without replacement: PPS sampling procedure (cumulative total and Lahiri's methods) and estimation of mean of finite population: Desraj's estimator for a generalized sample size and Murthy's estimator for sample size two.

TEXT BOOKS

1. Cochran, W. G. (**2007**).	Sampling techniques (3rd Edition). John Wiley & Sons(INDIA).
2. Mukhopadhyay, Parimal **(2008).**	Theory and Methods of Survey Sampling, (2nd Edition), Prentice Hall of India, New Delhi.
3. Murthy, M.N. (1967).	Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
4. Sukhatme, P.V., Sukhatme,B.V., Sukhatme, S. and Asok, C.(1984)	Sampling Theory of Surveys with Applications (3rd Edition)Iowa State University Press, USA and ISAS, Delhi.
5. Singh, S. (2003).	Advanced Sampling Theory With Applications: How Michael"" Selected"" Amy (Vol.1, 2). Springer Science & Business Media.
6. Thompson, Steven K. (2002).	Sampling, John Wiley and Sons, New York.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Students are knowledgeable about various sampling methods available to estimate parameters of the population.
- Students are able to prove the various properties of the each sampling scheme.
- Students are able to compare various sampling methods a view to select an appropriate one.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: M.Sc. Statistics
(Semester-II)

COURSE TITLE: DEMOGRAPHY & VITAL STATISTICS

COURSE CODE: MST-424

TOTAL HOURS: 90 hrs
Time: 3Hrs **MAXIMUM MARKS:100**
Medium: English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A which will be from entire syllabus (equally distributed from each unit), Section–B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section–A will consists of eight short answer type questions, each of 2.5 marks. Students are to attempt any six.
3. Sections–B, C, D & E will consist of two questions each**(each question should be sudivided into two parts)**. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 15marks.
4. Question paper should cover at least 40% article work from the recommended books.
5. Teaching time for this paper would be eight periods per week.

COURSE OBJECTIVE:

- To understand the concept of Vital statistics, measurement of mortality and measurement of fertility.
- To get familiar with population theory and rate of growth.
- To have knowledge about the method of projection ans use of life tables.

COURSE CONTENT:

UNIT-I

Vital Statistics : Definition, uses and methods of obtaining vital statistics, rates and ratios, measurement of population at a given time, measurement of Mortality: crude death rate, specific rates, infant mortality rate, prenatal mortality rate, standard death rates. Life tables: Construction of a complete life table and its uses.

UNIT-II

Abridged life tables: Kings method, Reed and Merrell's method, Greville's method, Keyfitz and Frauenthal's method and Chiang's method. Measurement of fertility: Crude birth rate, general fertility rate, age specific fertility rate, total fertility rate, relation between TFR

and CBR, gross reproduction rate and net reproduction rate, replacement index, standardized

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231A

COURSE TITLE: PAPER–I: Advanced probability-I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 35**

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will study the moments of bivariate probability distributions
- Students will learn about distributions to study the joint behavior of two random variables.
- Students will learn to compute expectation, covariance and correlation coefficients.
- It will enable the students to have good understanding of exploratory data analysis.

COURSE CONTENT:

Unit–I

Two dimensional random variables, their joint probability mass function and joint probability density function, marginal and conditional Probability Distributionsfunctions, Independent random variables.

Unit–II

Expected value of real valued function of two-dimensional random variables, variance of a linear combination of random variables, Moments of Bivariate Probability distributions, Bivariate moment generating function.

Unit–III

Conditional expectation and conditional variance, Covariance, correlation coefficient. Cauchy Schwartz Inequality and its applications

Unit–IV

Bivariate normal distribution, marginal and conditional probability distributions associated with the bivariate normal distribution. Chebyshev's inequality and its applications.

BOOKS PRESCRIBED:

1. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
2. Ross, S.A., First Course in Probability, Pearson Education, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.
3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Study the moments of Bivariate probability distributions
- learn about distributions to study the joint behavior of two random variables.
- Learn to compute expectation, covariance and correlation coefficients
- Learn the applications of Cauchy Schwartz Inequality and Chebyshev's inequality

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231B

COURSE TITLE: PAPER–II: Statistical inference–I

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English **MAXIMUM MARKS: 35**

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- Students will be able to apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- To enable the students to develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- To help the students to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

COURSE CONTENT:

Unit–I

Point estimation, estimator and estimates, criteria for good estimators, unbiasedness, consistency, efficiency and sufficiency (only the definitions and examples).

Unit–II

Minimum variance unbiased estimator, Methods of estimation: moments and maximum likelihood method of estimation.

Unit–III

Interval estimation. Interval estimate of the mean of a normal distribution, Neyman and Pearson's theory of testing hypothesis, the concepts of statistical hypothesis, two types of errors, critical region, significance level.

Unit-IV

Power and power function, Most powerful test, The Neyman Pearson theorem (only the statement) and its applications for testing a simple hypothesis against a simple alternative.

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol.I & II, World Press, 2005.
2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Understand Different methods of finding point estimators for unknown population parameters, their advantages and disadvantages .
- Learn Desirable properties of point estimators based on which estimators can be compared.
- Apply the general methods of constructing interval estimators (Confidence Intervals) for unknown population parameters
- Develop/ construct best/most powerful statistical tests to test hypothesis regarding unknown population parameters (Using Neyman-Pearson Lemma and Likelihood Ratio tests).
- Learn to construct good estimators based on unbiasedness, consistency, efficiency and sufficiency.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–III

COURSE CODE: STA-231P

COURSETITLE:Practical based on paper Statistical inference–I

CREDIT HOURS (PER WEEK): 3

Medium: English **TOTAL HOURS: 45 hrs**

Time: 2 Hours **MAXMIUM MARKS: 30**

(Practical Marks: 22

Internal Assesment Practical: 08)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10

COURSE OBJECTIVES:

- To make the students aware about the practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- To enable the studenst to draw inferences about the unknown population parameters based on random samples.
- To help the students to solve exercises on method of estimators, types of error, critical region , significance level.

COURSE CONTENT:

Teaching time for practical paper would be one hour per week.

List of practical exercises:

1. Exercises on unbiased, consistent, efficient and sufficient estimators
2. Exercises on methods of estimation
3. Exercises on interval estimation
4. Exercises on two types of errors, critical region, significance level,
5. Exercises on Most powerful test.

Chairperson, BoS in Mathematics

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of estimation theory and hypothesis testing pertaining to all discussed methods.
- Drawing inference about the unknown population parameters based on random samples
- Validating our estimation/ inference about the population using hypothesis testing.
- Solve exercises on method of estimators, types of error, critical region , significance level.
- Practice the question based on most powerful test.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241A

COURSE TITLE: PAPER–I: Advanced probability-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to understand the concept of sampling distributions and their applications in statistical inference
- To help the studenst to learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.

COURSE CONTENT:

Unit–I

Concept of statistics, sampling distribution and standard error, Sampling distributions: Chisquare, t and F distributions and their applications.

Unit–II

Sampling distribution of the mean of a set of independent random observations from a normal population, sampling distribution of the sample variance of independent random observations from a normal population (derivation of sample variance distribution is excluded). Expectation and variance of sampling mean and variance.

Unit–III

The law of large numbers, Bernoulli's form of the law of large numbers, Convergence in probability, the difference between convergence in probability and the ordinary convergence of calculus, convergence in distribution.

Unit–IV

The central limit theorem for independent identically distributed random variables and the outline of its proof using moment generating function. Applications of central limit theorem. Normal approximation to the Binomial distribution, Poisson distribution.

Chairperson, BoS in Mathematics

BOOKS PRESCRIBED:

5. Meyer, P.L. Introductory Probability and Statistical Applications, Addison—Wesley, (1970).
6. 2. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Biswal, P.C., Probability and Statistics, Prentice Hall of India, 2007.
2. Ross, S.A., First Course in Probability, Pearson Education, 2007.
3. Miller, I and Miller, M., Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2007.

COURSEOUTCOMES: On completing the course, the students will be able to:

- To understand the concept of sampling distributions and their applications in statistical inference
- Learn the applications of t and F distributions
- To develop clear understanding of Central Limit Theorem and its applications.
- Analyze categorical data by using Chi square techniques.
- Understand the laws of convergence and their inter relations

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241B

COURSE TITLE: PAPER–II: Statistical Inference-II

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

COURSE OBJECTIVES:

- To enable the students to have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- To allow the students to compare the two univariate normal distributions through their mean and variance.
- To help the students to apply Z test to check the significance of correlation coefficient, single proportion.
- To help the students to learn the applications of chi square test such as goodness of fit, independence of attributes

COURSE CONTENT:

Unit-I

A Large Sample Tests: Tests about the mean and variance of a univariate normal distribution, comparison of two univariate normal distributions through their means and variances.

Unit-II

Testing the significance of the correlation coefficient. Tests for significance for single proportion and for difference of two proportions, Z-transformation of the sample correlation, tests regarding the population correlation coefficient based on the Z-transformation. Chi-square tests for goodness of fit.

Unit-III

Chi-square test for homogeneity and for independence of attributes, simplified formula for Chi-square for testing homogeneity and for independence in 2x2 tables and axb contingency tables. Yates correction for continuity in 2x2 tables. Chi-square tests for significance for single variance. F-test for equality of variances.

Unit-IV

Small Sample Tests: t-tests for single population and two populations, paired t-test, t-test for significance of correlation coefficients and regression coefficients,

BOOKS PRESCRIBED:

1. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. I, World Press, 2005.
2. Goon. A.M., Gupta. M.K. and Dasgupta B., Fundamentals of Statistics, Vol. II, World Press, 2005.
3. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Company, 2007.

Books Suggested for Supplementary Reading:

1. Hogg. R.V. and Mckean, J.W. and Craig. A.T., Introduction to Mathematical Statistics, Pearson Education, 2007.
2. Miller, I and Miller, M., Mathematical Statistics with Applications, Pearson Education, 2007.

COURSE OUTOCMES: On completing the course, the students will be able to:

- have a clear understanding of when to apply various tests of hypothesis about population parameters using sample statistics and draw appropriate conclusion.
- Compare the two univariate normal distributions through their mean and variance.
- Apply Z test to check the significance of correlation coefficient, single proportion.
- Learn the applications of chi square test such as goodness of fit, independence of attributes
- Use the t- test for checking the significance of single population and double population.

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–IV

COURSE CODE: STA-241P

COURSE TITLE: Practical based on paper Statistical inference–II

CREDIT HOURS (PER WEEK):3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

INSTRUCTIONS FOR PAPER SETTER AND STUDENTS:

Students are required to prepare a practical note book with at least 30 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators.

The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 07
3. Exercises: 10

Teaching time for practical paper would be one hour per week.

COURSE OBJECTIVES:

- To help the students to understand the practical applications of large and small sample tests.
- To draw the inference about the unknown population parameters based on various tests.
- To enable the students to validate the significance of hypothesis using various tests.

COURSE CONTENT:

List of practical exercises

1. Exercises on Large Sample Tests
2. Exercises on Z-transformation
3. Exercises on applications of Chi square test
4. Exercises on applications of t - test
5. Exercises on application of F – test

COURSE OUTCOMES: On completing the course, the students will be able to:

- Practical applications of large and small sample tests.
- Drawing inference about the unknown population parameters based on various tests.
- Validate the significance of hypothesis using various tests.
- Solve exercises on Z transformation.
- Practice the question based on application of Chi square test.

Chairperson, BoS in Mathematics

KHALSA COLLEGE, AMRITSAR

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351A

COURSE TITLE: PAPER–I: LINEAR MODELS AND DESIGN OF EXPERIMENTS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Linear models, the fixed effect models, the distribution of minimum error sum of squares and the conditional minimum error sum of squares, tests of general linear hypotheses. Analysis of one way classified data under the fixed effect model expectations of various mean sum of squares in one way classified data.

SECTION–B

Analysis of two way classified data with one observation per cell under the fixed effect models, Analysis of two way classified data with multiple but equal observation in cell under the fixed effect models, expectations of various mean sum of squares in two way classified data.

SECTION–C

Terminologies in experimental designs, basic principles of design of experiment: randomization, replication and local control, completely randomized design, randomized block design and the latin square design, balanced incomplete block design and their advantages, disadvantages and analysis.

SECTION–D

Factorial experiments, the concept of main effects and interactions in and factorial experiments and the sum of squares due to them. Yates method of computing the sum of squares due to the main effects and interactions in and factorial designs, statistical analysis of these experiments (excluding confounding).

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamentals of Statistics, Vol. II, World Press, 2005.
2. Das, M.N. and Giri, N.C. Design and Analysis of Experiment, New Age International Publisher, 2003.
3. Gupta, S.C. and Kapoor, V.K,. Applied Statistics, Sultan Chand and Company, 2007.

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KHALSA COLLEGE, AMRITSAR

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351B

COURSE TITLE: PAPER–II: THEORY OF SAMPLE SURVEYS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Introduction to design of sample surveys, census and sample surveys, basic principles of sample surveys, planning a sample survey, sampling and non sampling errors. Simple random sampling (WR and WOR) and its results, estimation of mean: its mean and variance and its estimate.

SECTION–B

Estimation of proportion: its mean and variance, stratified random sample (WOR): estimation of mean: its mean and variance and its estimate (under WOR), proportional. Neyman and optimum allocations.

SECTION–C

Ratio, product and regression estimates of population mean: their approximated (under large sample) expected values and variances under SRSWOR, comparisons with mean per unit estimate (under SRSWOR)

SECTION–D

Regression estimates of population mean: their approximated (under large sample) expected values and variances under SRSWOR, comparisons with mean per unit estimate (under SRSWOR)

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. Fundamentals of Statistics, Vol. II, World Press, 2005.
2. Singh, D. and Chaudhary, F.S., Theory and Analysis of sample survey design, New Age International Publisher, 2002.
3. Mukhopadhyar, P., Theory and Methods of Survey Sampling, Prentice Hall, 2000.
4. Gupta, S.C. and Kapoor, V.K,. Applied Statistics, Sultan Chand and Company, 2007

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KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–V

COURSE CODE: STA-351P

COURSE TITLE: PAPER-III: - Practical based on PAPER–I: LINEAR MODELS AND DESIGN OF EXPERIMENTS

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CREDIT HOURS (PER WEEK):3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

Teaching time for practical paper would be one hour per week.

List of Practicals Exercises 1. Exercises on analysis of variance for one way classified data and Completely Randomized design

2. Exercises on analysis of variance for two way classified data with one observation per cell and Randomized Complete Block design

3. Exercises on analysis of variance for two way classified data with multiple but equal observations per cell

4. Exercises on analysis of variance for Latin Square design

5. Exercises on analysis of variance for Balanced Incomplete Block design

6. Exercises on analysis of variance for 2 and 2 factorial experiments

Students are required to prepare a practical note book with at least 15 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 10
3. Exercises: 15

KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361A

COURSE TITLE: PAPER–I: ECONOMIC STATISTICS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

Medium: English

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Introduction to index number, problems in the construction of index numbers, Laspyeres, Passche's, Drobish-Bowley, Walsh Marshal-Edgworth and Fisher's formulae for index numbers.

SECTION–B

Errors in index numbers, various tests for the criterion of a good index numbers, chain index number, cost of living index numbers, uses of index numbers.

SECTION–C

Introduction of time series, the four components of a time series, measurement of secular trend by graphic method, method of semi averages, the method of moving averages and fitting of mathematical curves.

SECTION–D

Measurement of seasonal fluctuations by method of simple averages, ratio to moving average, ratio to trend and link relative methods, measurement of cyclical fluctuations (excluding periodogram analysis).

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B., Fundamentals of Statistics, Vol.-II, World Press, 2005.
2. Medhi, J., Statistical Methods. New Age International Publishers, 2000.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.
4. Gupta, S.C. and Kapoor, V.K., Applied Statistics, Sultan Chand and Company, 2007.

KHALSA COLLEGE, AMRITSAR

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Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361B

COURSE TITLE: PAPER–II: VITAL STATISTICS AND INDUSTRIAL STATISTICS

CREDIT HOURS (PER WEEK):4

TOTAL HOURS: 60 hrs

MAXIMUM MARKS: 35

Time: 3 Hours **(Theory Marks: 26**

Theory Internal Assessment: 09)

Medium: English

INSTRUCTIONS FOR THE PAPER SETTERS:

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

SECTION–A

Vital statistics, data for vital statistics, rate of vital events, measurement of mortality, crude, specific and standardized death rates, cause of death, infant Mortality. Fertility rates. Measurement of fertility.

SECTION–B

Crude birth rate, general fertility rate, age specific fertility rate, general and total fertility rates. Measurement of population growth, growth reproduction rate and net reproduction rate.

SECTION–C

Statistical quality control: chance and assignable causes, process and product control, the techniques of control charts for process control, three sigma limits and specification limits. Schewharts Control charts for mean, S.D. and Range, Control Chart for number of defective and fraction defective, control charts for number of defects.

SECTION–D

Advantages of process control, sampling inspection by attributes for product control, the concept of producer's and consumer's risks, AQL, LTPD, AOQL, ASN, ATI and OC functions and curves, single and double sampling plans and their properties.

Books Recommended:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B., Fundamentals of Statistics, Vol.-II, World Press, 2005.
2. Medhi, J., Statistical Methods. New Age International Publishers, 2000.
3. Nagar, A.L. and Das, R.K., Basic Statistics, Oxford University Press, 2005.
4. Gupta, S.C. and Kapoor, V.K., Applied Statistics, Sultan Chand and Company, 2007.

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KHALSA COLLEGE, AMRITSAR

(An Autonomous College)

Syllabus for

PROGRAMME: B.A. (Semester System) (12+3 System of Education)

SEMESTER–VI

COURSE CODE: STA-361P

COURSE TITLE: PAPER-III: - Practical based on PAPER–I: ECONOMIC STATISTICS and PAPER–II: VITAL STATISTICS AND INDUSTRIAL STATISTICS

CREDIT HOURS (PER WEEK): 3

TOTAL HOURS: 45 hrs

Time: 2 Hours

MAXIMUM MARKS: 30

(Practical Marks: 22

Internal Assesment Practical: 08)

Teaching time for practical paper would be one hour per week.

List of practical exercises 1. Exercises on construction of index numbers: Laspyere's, Passche's, Drobish-Bowley's, Walsh Marshal-Edgworth's, Fisher's

2. Exercises on measurements of secular trend using graphic method, semi averages method, curve fitting method and moving average method

3. Exercises on fitting of various mathematical curves using least square principle

4. Exercises on measurements of seasonal fluctuations using simple average method, ratio to trend method, ratio to moving averages, and link relative method

5. Exercises on measurements of mortality: crude death rate, specific death rate, standardized death rate

6. Exercises on measurements of fertility: crude birth rate, general fertility rate, specific fertility rate, total fertility rate 7. Exercises on measurements of population growth: Crude rate, gross reproduction rate, net reproduction rate

8. Exercises on construction of three sigma limits of control charts for mean, standard deviation, and range

9. Exercises on construction of three sigma limits of control charts for number of defective, fraction defective, and number of defects.

Students are required to prepare a practical note book with at least 15 exercises based upon the above list. At the end of semester, there is a practical examination jointly conducted by two examiners (one is internal and other one is external). External examiner is appointed by the university and the internal examiner is appointed by the principal of the concerned college. This practical examination will cover a written test followed by a viva-voce to test the practical knowledge of students about the contents. The candidates are allowed to use Non–Programmable calculators. The distribution of marks is as under:

1. Practical Note book: 05
2. Viva – voce: 10
3. Exercises: 15

UNIT-III

Structure of populations: Stable and quasi-stable populations, Fundamental equation of stable population theory, intrinsic rate of growth, intrinsic birth and death rates, intrinsic age distribution, Leslie's model of population growth .

UNIT-IV

Population Projection : Projected values & estimates, method of Projection, populationsize, population composition. Survival rates: UN model life table, model life tables of Coale and Demeny, Ledermann's model life tables. Fertility Rates: Pearson's Type-I curve,
Romanink's model and Coale's model fertility schedules.

TEXT BOOKS

1. R. Ramakumar, Y. S. Gopal (1986): Technical Demography. , Wiley, Eastern Limited.
2. S. C. Gupta and V. K. Kapoor (2014): Fundamentals of Applied Statistics, 4th Edition, Sultan Chand & Sons.

REFERENCE READINGS

1. Benjamin, B. (1975): Demographic Analysis, George, Allen and Unwin Limited.
2. Cox, P. R. (1970): Demography, Cambridge University Press. 5th Edition.
3. Keyfitz, N. (1985): Applied Mathematical Demography, Springer Science + Business Media, LLC. 2nd Edition.

COURSE OUTCOMES: On completing the course, the students will be able to:

- Deal with the problems of death rate and birth rate.
- Solve the practical problems based on population.

Khalsa College, Amritsar

(An Autonomous College)
Syllabus for
PROGRAMME: M.Sc. Statistics
(Semester-II)

COURSE TITLE: COMPUTER ORIENTED STATISTICAL PRACTICALS –II

COURSE CODE: MST-425

TOTAL HOURS: 90 hrs

Time: 3Hrs **MAXIMUM MARKS:100**
Medium: English **(Theory :75**
Internal Assesment:25)

INSTRUCTIONS FOR THE PAPER-SETTERS

1. The paper will be set in two separate parts PART-A and PART-B .The setting and evaluation will be done by a Board of examiners consisting of Head (Chairman), External Examiners and Teacher (S) involved with the teaching of this paper.
2. PART-A of this paper will be set on the spot and will be of one and a half hours duration. This part will consist of two problems. The problems will be based on theory papers **COURSE CODE: MST 422, COURSE CODE: MST 423 & COURSE CODE: MST 424** using Programming in " c " & / or Statistical Software packages such as MINITAB , SPSS , STATGRAF, STATISTICA, SAS, etc.
3. PART-B of the paper will be of one and a half hours duration .This part will consist of FOUR questions **based on theory papers COURSE CODE: MST 422, COURSE CODE: MST 423 & COURSE CODE: MST 424** with at least one question from each of these papers. The candidates will be required to attempt any TWO questions using electronic device.
4. The division of marks ,out of a total of 75 and Minimum pass Marks, will be as follows :

Maximum Marks	:	75
Minimum pass Marks	:	30(40%)
Sessional work	:	15
Viva	:	12
Exercises based on Part A	:	20
Exercises based on Part B	:	28

COURSE CONTENT:

SYLLABUS DETAILS FOR PAPER-COURSE CODE: MST 425 (PRACTICAL)

PART-A : Programming in " C " &/or Applying statistical software packages for problems based on Theory papers **COURSE CODE: MST 422, COURSE CODE: MST 423 & COURSE CODE: MST 424.**
Use of Statistical Software packages such as MINITAB , SPSS , Statgraf etc.

PART-B :Practical Exercises for Statistical techniques based on topics in papers
COURSE CODE: MST 422, COURSE CODE: MST 423 & COURSE CODE: MST 424.

RECOMMENDED READINGS

Stoodly. K.: Applied and computational Statistics, Ellis Howard.

COURSE OUTCOMES:

- Derive important statistical programme for moment generating function, joint probability mass functions, marginal densities, conditional distributions.
- Possess deeper understanding of the properties and uses of various computer languages to develop programme for discrete distributions and continuous distributions.