FACULTY OF SCIENCES

SYLLABUS

Master of Science (Mathematics) (FYIP)

(Semester: I -II)

(Under Credit Based Continuous Evaluation Grading System)
(CBCEGS)

Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR

(Autonomous)

Master of Science (Mathematics)(FYIP)

Session: 2024-25

Programme Specific Outcomes

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

PSO1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theorem of Mathematics and their applications in the real world to an advanced level, enhance career prospects in a huge array of field suitable to succeed at an entry level position in Mathematics post graduate program.

PSO2: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics, Chemistry, Electronics, Computer Science and Economics.

PSO3: Create and develop Mathematical software application using a systematic approach & apply discrete Mathematical concept to practical application.

PSO4: Demonstrate knowledge of Calculus I & II, Matrices and Theory of Equations, Analytical and Solid Geometry, Statics & Tensor Calculus and able to apply this knowledge to analyze a variety of Mathematical Phenomena.

PSO5: Demonstrate knowledge of physical chemistry & apply this knowledge to analyze a variety of chemical phenomena & will be able to interpret and analyze quantitative data.

PSO6: Understand and demonstrate the knowledge of Mechanics, area, volume and displacement with differential equation of the orbit.

PSO7: Understand the basic concepts and basic principles of Demand and Supply, Measurement of Price Elasticity of Demand and apply Economic theories to derive cost function from Production Function.

PSO8: Learn implications of Revenue curves and their mutual relationships.

PSO9: Develop statistical approach and mathematical thinking among students to problem solving on a diverse variety of disciplines.

PSO10: Have knowledge of computer fundamentals, able to handle practical programming problems using C and analyze large volume of data using various statistical techniques

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics) (FYIP)

Semester-I

Session- 2024-25

Master of Science (Mathematics) (FYIP) Semester-I										
Course Code	Course type	Course Title	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Max. Marks				Examination time in hours
						Total	Th	P	CA	
FMAL-1421/ FMAL-1031/ FMAL-1431	C	[1]Punjabi (Compulsory)/ [2] Basic Punjabi/ [3] Punjab History and Culture	2-0-0	2-0-0	2	50	40	-	10	3
FMAL-1102	AEC	Communicative English	2-0-0	2-0-0	2	50	40	-	10	3
FMAL-1333	DSC	Calculus	5-0-0	5-0-0	5	100	80	-	20	3
FMAL-1334	DSC	Theory of Equations	5-1-0	5-1-0	6	100	80	-	20	3
FMAL-1335 OR	C	[4]Dynamics OR [5]Mechanics - I	4-0-0 3-0-0	4-0-0 3-0-0	4 3	100 75	80 60	- -	20 15	3 3

FMAL-1395										
FMAL-1136	SEC	Programming Language - I	3-0-0	3-0-0	3	75	60	-	15	3
FMAP-1337	DSC	Calculus Laboratory	0-0-2	0-0-1	1	25	-	20	5	3
FMAP-1398	C	Mechanics Laboratory - I	0-0-2	0-0-1	1	25	-	20	5	3
FMAP-1139	SEC	Programming Laboratory - I	0-0-2	0-0-1	1	25	-	20	5	3
VACF-1492	VAC	*Foundation Course	2-0-0	2-0-0	2	50	40	-	10	1
Total					26					

C-Compulsory

VAC-Value Added Courses

SEC-Skill Enhancement Courses

AEC-Ability Enhancement Courses

DSC-Discipline Specific Courses

Note:

[1]Domicle / Non Domicile of Punjab students who have studied Punjabi till 8^{th}/ 10^{th} class will study Punjabi (compulsory)

[2,3]The Non-Domicile of Punjab Students who have not studied Punjabi till 8^{th}/10^{th} class can choose either Basic Punjabi or Punjab History and Culture (PHC)

[2]Domicile of Punjab students who studied out of Punjab and did not study Punjabi till 8^{th} / 10^{th} class will have to study Basic Punjabi

[2]Domicile of Punjab students who have studied in Kendriya Vidyalaya of Punjab or any other school and due to any reason did not study Punjabi till 8th/10th class will have to study Basic Punjabi

[4] Only those students can opt this course who have not studied Physics, Chemistry at +2 level.

[5]Only those students can opt this course who have studied Physics, Chemistry and Mathematics at +2 level.

[*] Marks of this paper will not be added in total marks. Grades will be provided.

Master of Science (Mathematics)(FYIP)
Semester–I

Session- 2024-25
Course Title: Basic Punjabi
Course Code: FMAL-1031
Course Outcomes

CO1:w[ZYbhgzikphgVQkT[D dkwB'oEftfdnkoEhnK B{z gzikphGkPk B{z f;ykT[D dh gqfefonk ftu gk e/ fJe j'o GkPk f;ZyD dk w"ek gqdkBeoBk j?.ftfdnkoEhnK B{zg?AshnZyoh, nZyoeqw, g?ofpzdhtkb/ toD ns/ g?o ftu g?D tkb/ toD ns/ wksoktK (wZ[YbhikDgSkD) brk\o (fpzdh, fNZgh, nZXe) dh gSkD ns/ tos'A s'AikD{ eotkfJnkikt/rk.

CO2:ftfdnkoEhnK B{z gzikphPpdpDso dh wZ[YbhikDgSkD (;kXkoBPpd, ;z:[es Ppd, fwPos Ppd,w{b Ppd,nr/so ns/ fgS/so) s'AikD{ eotkfJnkikt/rk.

CO3:ftfdnkoEhnK B{zfBZstos'A dh gzikphPpdktbh L pkIko, tgko, foPs/Bks/, y/sh ns/ j'oXzfdnKnkfd Bkb ;zpzXs s'AikD{ eotkfJnkikt/rk.

CO4:ftfdnkoEhnK B{z gzikphftuj|s/ d/ ;ZsfdBK d/ BK, pkoQKwjhfBnK d/ BK, oZ[sK d/ BK, fJes'A ;" sZefrDshPpdKftuf;ykT[Dk j?.

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25
Course Title: Basic Punjabi
Course Code: FMAL-1031

;wK L 3 xzN/ **Maximum Marks: 50**

L-T-P **Theory: 40**

2-0-0 **CA : 10**

nze tzv ns/ gohfyne bJh jdkfJsK

1H gqPB gZso d/ uko ;?ePB j'Dr/.;?ePB A-D sZe d/ gqPB :{fBN I-IV ftu'A g[ZS/ ikDr/. jo ;?ePB ftu d' gqPB g[ZS/ ikDr/.

2H ftfdnkoEh B/ eZ[b gzi gqPB eoB/ jB. jo ;?ePB ftu'A fJe gqPB eoBk bkIwh j?. gzitK gqPB fe;/ th ;?ePB ftu'A ehsk ik ;edk j?.

3H jo/e gqPB d/ 8 nze jB.

4H g/go ;?ZN eoB tkbk i/eo ukj/ sK gqPBK dh tzv nZr'A tZX s'A tZX uko T[g gqPBK

ftu eo ;edk j?.

gkmeqw

:{fBN-I

g?AshnZyoh, nZyoeqw, g?ofpzdhtkb/ toD ns/ g?oftug?Dtkb/ toD ns/ wksqtK (wZ[Ybh

ikDgSkD) brk\o (fpzdh, fNZgh, nZXe) L gSkD ns/ tos'A .

8nze

:{fBN-II

gzikphPpdpDso L wZ[YbhikDgSkD (;kXkoBPpd, ;z:[esPpd, fwPosPpd, w{b

Ppd, nr/so ns/ fgS/so)
8nze

:{fBN-III

fBZstos'A dh gzikphPpdktbh L pkIko, tgko, foPs/Bks/, y/sh ns/
j'oXzfdnKnkfdBkb

;zpzXs.
8 nze

:{fBN-IV

j|s/ d/ ;ZsfdBK d/ BK, pkoQKwjhfBnK d/ BK, oZ[sK d/ BK, fJes'A ;" se frDshPpdKftu .

8 nze

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25

Course Title: Punjabi Compulsory
Course Code: FMAL-1421
Course Outcomes

CO1:';kfjs d/ ozr' g[[[;se d/ eftskGkrBz{ gVQkT[D dkwB'oEftfdnkoEhnKnzdoeftskgqshfdbu;gh, ;{M Bz{ g?dkeoBk j? sKfe T[j nkX[fBed"oftuubojhnKekftXkoktK ns/ ethnKpko/ frnkBjk;beo ;eD.fJ; dkj'owB'oEeftsk dh ftnkfynk, ftPb/PD s/ w[bzeD dh gqfefonks'AikD{ eokT[Dkth j? sKfe T[j ;wekbh ;wkidhnK ;wZf;nktKBz{ ;wM ;eD ns/ nkb'uBkswefdqPNhpDk ;eD.

CO2:';kfjs d/ ozr' g[[[;se d/ ejkDhGkr B{z f;b/p; ftuPkfwbeo e/ ftfdnkoEhnKnzdoejkDhgVQD dh o[uh Bz{ g?dkeoBk j? ns/ ejkDhirsBkbi'VDk j?.

CO3:g?oQk ouBk ns/ g?oQkgVQ e/ gqPBK d/ T[so d/D dkwBo'EftfdnkoEhnK dh p[ZXh B{z shyDeofdnK T[BK dh fbyDgqfsGk B{z T[ikroeoBk j?.

CO4:X[BhftT[As gVQDBkbftfdnkoEh X[BhnK dh T[ukoBgqDkbhs'Atke| j'Dr/.

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25

Course Title: Punjabi Compulsory
Course Code: FMAL-1421

;wK L 3 xzN/ **Maximum Marks: 50**
L-T-P **Theory : 40**
2-0-0 **CA :10**

nze tzv ns/ gohfyne bJh jdkfJsK

1H gqPB gZso d/ uko ;?ePB j'Dr/.;?ePBA-DsZe d/ gqPB :{fBNI-IV ftu'A g[ZS/ ikDr/. jo ;?ePB ftu d' gqPB g[ZS/ ikDr/.

2H ftfdnkoEh B/ eZ[b gzi gqPB eoB/ jB. jo ;?ePB ftu'A fJe gqPB eoBk bkIwh j?. gzitK gqPB fe;/ th ;?ePB ftu'A ehsk ik ;edk j?.

3H jo/e gqPB d/ 8 nze jB.

4H g/go ;?ZN eoB tkbk i/eo ukj/ sK gqPBK dh tzv nr'A tZX s'A tZX uko T[g gqPBKftu eo ;edk j?.

gkmeqw ns/ gkm g[;seK

:{fBN-I

;kfjs d/ ozr (;zgkHvkwfjbf;zx),Gkrgfjbk(eftsk),
oth ;kfjsgqekPB,nzfwqs;o.
(ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ,;ko)
(vkHjfoGiBf;zx,gkP,;[oihsgkso eth gkmeqwdkfjZ;kBjhAjB)8nze

:{fBN-II

;kfjs d/ ozr (;zgkHvkwfjbf;zx),Gkrgfjbk(ejkDh),
oth ;kfjsgqekPB,nzfwqs;o.
(;ko,ftPkt;s{)
(e'JhfJe ;tko,x'NDk, nkgDknkgDkfjZ;kejkDhnKgkmeqwdkfjZ;kBjhAjB)8 nze

:{fBN-III

g?oQkouBk

g?oQkgVQ e/ gPqFBK d/ T[so.8 nze

:{fBN-IV

(T) gzikph X[BhftT[As LgfoGkPk s/T[ukoBnzr

(n) ;to, ftnziB8 nze

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25

Course Title: Punjab History and Culture
Course Code: FMAL-1431

COURSE OUTCOMES

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab.

CO1: Identify and understand the sources and physical features of Punjab

CO 2: To study the earliest civilisation (Indus Valley Civilization) and original home of Aryans

CO 3: To examine the Social, Religious and Economic life during Early and Later Vedic Age

CO 4: To comprehend the Buddhist, Jain and Hindu faith and their relevance in the modern times

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25

Course Title: Punjab History and Culture
Course Code: FMAL-1431

Examination Time: 3 Hours **Max. Marks: 50**
Credits L-T-P: 2-0-0 **Theory: 40**
Contact Hours: 2 Hrs/Week **CA: 10**

Instructions for the Paper Setter:

1. Question paper shall consist of four Units
2. Examiner shall set 8 questions in all by selecting Two Questions of equal marks from each Unit.
3. Candidates shall attempt 5 questions in 600 words, by at least selecting One Question from each Unit and the 5th question may be attempted from any of the four Units.
4. Each question will carry 8 marks

Unit-I

1. Physical features of the Punjab
2. Sources of the ancient history of Punjab

Unit-II

3. Harappan Civilization: social, economic and religious life of the Indus Valley People.
4. The Indo-Aryans: Original home

Unit-III

5. Social, Religious and Economic life during Early Vedic Age.
6. Social, Religious and Economic life during Later Vedic Age.

UNIT-IV

7. Teachings of Buddhism
8. Teachings of Jainism

Suggested Readings

- B.N. Sharma, Life in Northern India, Delhi. 1966.
- Budha Parkash, Glimpses of Ancient Punjab, Patiala, 1983.
- Chopra, P.N., Puri, B.N., & Das,M.N.(1974). A Social, Cultural & Economic History of India, Vol. I, New Delhi: Macmillan India.
- L. M Joshi (ed.), History and Culture of the Punjab, Art-I, Patiala, 1989 (3rd edition)
- L.M. Joshi and Fauja Singh (ed.), History of Punjab, Vol.I, Patiala 1977.

Master of Science (Mathematics)(FYIP)

Semester–I

Session- 2024-25
Course Title: Communicative English
Course Code: FMAL-1102
Course Outcomes

The students will be:

CO 1: able to enhance their vocabulary through vocabulary building exercises

CO2: able to improve their writing skills by writing letters and reports

CO3: able to enhance their reading and analyzing power of texts through guided reading by the study of “Making Connections” by Kenneth J. Pakenham

CO4: acquainted to the techniques of effective essay writing

Master of Science (Mathematics)(FYIP)

Semester–I
Session- 2024-25
Course Title: Communicative English
Course Code: FMAL-1102

Examination Time: 3 Hours | Max.Marks: 50
Theory: 40
L T P | CA:10
2 0 0

Instructions for Paper Setters:

Eight questions of equal marks (08 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four).Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

"Word List", "Correct Usage of Commonly used words and Phrases" from the chapter "Vocabulary" given in The Written Word by Vandana R. Singh

Unit-I

Letter- writing as prescribed in The Written Word by Vandana R. Singh
Report writing as prescribed in The Written Word by Vandana R. Singh

Unit-III

Unit-I from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition

Unit-IV

Unit-II from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition

Text books:

The Written Word by Vandana R. Singh, Oxford University Press, New Delhi.
Making Connections: A Strategic Approach to Academic Reading by Kenneth J.Pakenham, Second Edition

Master of Science (Mathematics)(FYIP)

Semester–I
Session- 2024-25
Course Title: Calculus
Course Code: FMAL-1333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand real number system, limit of a function, basic properties of limit, continuity, and classification of discontinuities & to apply it in real world problem.

CO 2: To Classify the difference between increasing and decreasing functions and understand the concept of Differentiability of functions and maxima & minima.

CO 3: Demonstrate Asymptotes, points of inflexion, multiple points on a curve & also to differentiate between concavity and convexity.

CO 4: To understand the concepts of Riemann sum, definite integrals and their properties, the fundamental theorem of calculus, applications to length of arc and area bounded between curves, Reduction Formulae & to apply in a wide variety of disciplines like Bio, Eco, Physics & Engineering.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Calculus
Course Code: FMAL-1333

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
CA:20

L T P
5 0 0

Instructions for Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four).Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Review of limit and continuity of a function of real variable, indeterminate forms, higher order derivatives, Leibnitz theorem and applications to problems of the type

$$e^{ax}\sin(bx+c)\,,\ e^{ax}\cos(bx+c)\,,\ (a+bx)^n\sin x,\ (a+bx)^n\cos x.$$

Unit II

Differentiability of functions of real variable, increasing and decreasing functions, maxima and minima, Taylor's and Maclaurin's theorem with various forms of remainders.

Unit III

Concave upward, Concave downward, Point of inflexion, Asymptotes, Horizontal and Verti+cal Asymptotes, asymptotes of the algebraic curves represented by homogeneous equation in two variables,

Unit IV

Anti derivative of function of real variable, Riemann sums, definite integrals and their properties, the fundamental theorem of calculus, applications to length of arc and area bounded between Cartesian curves, Reduction Formulae, illustration of Reduction Formulae of type $\int \mathrm{Sin}^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \mathrm{Sec}^n x\,dx$, $\int \mathrm{Sin}^n x \mathrm{Sin}^m x\,dx$

Text Book:

1.Thomas, G.B., and Finney, L.R., Calculus and Analytic

Geometry, 9th Edition, Addison Wesley, 1998, (Scope as in Ch.1-7, 9, 11).

Reference Books:

1. Apostol, T.M., Calculus, An Indian Adaptation, Wiley, 2022.
2. Anton, H., Bivens, I., and Davis, S., Calculus, 12th Ed. John Wiley and Sons (Asia)P. Ltd, Singa- pore, 2002. (Scope as in ch.0-3, 6, 10,12)
3. R. Courant and F. John. Introduction to Calculus and Analysis (Vol. 1), Springer, 1999. (Scope as in Ch.4)

Master of Science (Mathematics) (FYIP)

Semester–I
Session-2024-25
Course Title: Theory of Equations
Course Code: FMAL- 1334
Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of Greatest Common Divisor, Unique Factorization of Polynomial over a field F

CO 2: To find the relations between the roots and coefficients of general equation in one variable, distinguish between solution of cubic equations and Bi-quadratic equations.

CO 3: Classify Symmetric functions, Solutions of reciprocal and binomial equations, and Algebraic solutions of the cubic and biquadratic Equations using Cardan's Method, Descarte's Method, Ferrari Method.

CO 4: Obtain homogeneous products, limits of the roots of equations and Separation of the roots of equations.

Master of Science (Mathematics) (FYIP)
Semester: I
Session: 2024-25
Course Title: Theory of Equations
Course Code: FMAL- 1334

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
L T P | CA:20
5 1 0

Instructions for Paper Setters: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

General properties of polynomials, Graphical representation of a polynomial, maximum and minimum values of a polynomials, Euclid's Algorithm, Greatest Common Divisor, Unique Factorization of Polynomial over a field F of numbers (Statement Only), Fundamental Theorem of Algebra (Statement only), Roots and their Multiplicity.

Unit II

General properties of equations, Relationship between the roots and the coefficients, Fundamental theorem of symmetric polynomials (without proof), Evaluation of symmetric functions of roots, Rational roots of polynomials with integral coefficients, Descarte's rule of signs positive and negative rule.

Unit III

Symmetric functions, Applications of symmetric function of the roots, Transformation of equations, Solutions of reciprocal and binomial equations, Algebraic solutions of the cubic and biquadratic Equations using Cardan's Method, Descarte's Method, Ferrari Method.

Unit IV

Symmetric functions of the roots, Newton's theorem on the sums of powers of roots, homogeneous products, limits of the roots of equations, Separation of the roots of equations

Text Books:

1. Burnside, W.S. and Panton, A.W., The Theory of Equations, Dublin University Press, 1954.
2. MacDuffee, C.C., Theory of Equations, John Wiley & Sons Inc., 1954.

Reference Book:

1. Kishan, H., Theory of Equations, Atlantic Publications, 2022.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Dynamics
Course Code: FMAL -1335

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate the basic relations between distance, time, velocity and acceleration, manage to solve the problems of Newton's Laws of Motion and the motion of particles connected by a string.

CO 2: Illustrate motion along a smooth inclined plane. Solve different types of problems with Variable Acceleration. Discuss Simple Harmonic Motion.

CO 3: Understand the concept of projectile, oscillating system.

CO 4: Define Work, Power and Energy and explain their relationship. Use measurement tools to apply the concepts of Work and power to solve real life problems. Identify the different types of energy.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Dynamics
Course Code: FMAL -1335

Examination Time: 3 Hours Max. Marks: 100
L T P Theory: 80
4 0 0 CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

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.

Text Book:
R. Kumar, Fundamentals of Dynamics, Pardeep Publications, Jalandhar city, second edition, 2004

Reference Books:

1.F. Chorlton, Text Book of Dynamics, CBS Publishers, New Delhi, second edition, 2004 (Scope in chapters 3,8).

2. S.R. Gupta, Elementary Analytical Dynamics, Sultan Chand and Company, New Delhi, Fourteen Edition, 1983(Scope in chapters 1,2,3)

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Mechanics - I
Course Code: FMAL-1395

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and their applications. Students will learn the applications of Newton's laws of motion in various situations such as variable mass systems.

CO2:They will understand the elastic scattering in lab and centre of mass systems. They will learn the rotational motion of a body in general by studying Euler's equations and the Moment of inertia tensor.

CO3: Know the fundamental forces of nature, the concept of centre mass, central forces and the motion of particles under central force and to determine the turning points oforbit.They will be able to understand planetary motion by solving differential equations of orbits and studying Kepler's laws.

CO4: They will learn Galilean transformations and understand the origin of fictitious forces in non-inertial frames. They will understand the consequences fictitious forces on acceleration due to gravity, motion of a particle on earth, and Foucault's pendulum.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Mechanics - I
Course Code: FMAL-1395

Examination Time: 3 Hours **Max. Marks: 75**
Theory: 60
L T P **CA: 15**
3 0 0

Instructions for Paper Setters:

Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Reference frames, Inertial frames,Displacement, velocity& acceleration in Cartesian, Plane polar, and Sphericalpolar coordinate systems,Area and volume in these coordinate systems. solidangle.Review of Newton's Laws of Motion, Momentum of variable-mass system: motion of the rocket.

Unit II

Elastic and inelastic collisions in laboratory and centre ofmass systems; velocities, angles, energies in these systems and their relationships. Rotational motion of the rigid body, Torques due to internalforces, angular momentum about the centre of mass, Principal axes and inertia tensor, Kinetic energy of rotation, Euler's equations,

Unit III

Forces in nature (Qualitative). Conservative forces. Central Forces.Motion of a particle under a central force field, Two-body problem and its reduction to one-body problem and its solution, Reduced mass, Equation of motion of a reduced mass under central force and energy. Differential equation of the orbit, Equation of orbit under inverse square force field, turning points, Kepler's Laws.

Unit IV

Galilean transformations; Galilean invariance of space &time intervals, Newton's laws of motion and conservation laws. Non-inertial frames, Fictitious forces. Effect of rotation of the earth on'g'. Effects of centrifugal and Coriolis forces produced as a result of earth's rotation. Foucault's pendulumandits equationofmotion.

BooksRecommended:

1. Knight,W.D.,Ruderman,M.A.,Helmholtz,C.A.andMoyer,R.J.,BerkeleyPhysicsCourse,Vol.IMechanics
2. Halliday, D., Resnick, R., and Walker, J., Fundamentals of Physics, 6Edition, Wiley India Pvt.Ltd,NewDelhi, 2004.

3. Gupta, S.K., Analytical Mechanics,ModernPublishers.AnIntroductiontoMechanics,DanielKleppner &Robert Kolenkow, Tata McGraw Hill Publishing CompanyLtd., New Delhi.
4. Feynman, R.P., Leighton, R. and Sands, M., The Feynman Lectures in Physics, The New Millennium Edition, Basic Books, Vol.I, Mechanics,

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Programming Language - I
Course Code: FMAL- 1136
Course Outcomes

After passing course the student will be able to:

CO1: Articulate various kind of software and hardware used in computers.

CO2: Work with different set of operations in C programming.

CO3: Apply various control statements of C Programming Language for designing solutions to different real world problems.

CO4: Implement single and multidimensional arrays for representing complex data collections.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Programming Language - I
Course Code: FMAL- 1136

Examination Time: 3 Hours Max. Marks: 75
Theory: 60
L T P CA:15
3 0 0

Instructions for the Paper Setters: Eight questions of equal marks (12 Marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT-I

Introduction to Computer Programming, Program Development life cycle, algorithms, flow chart, decision table & pseudo code.

UNIT-II

Introduction to C language, data types, Operators and Expression, Input/output Functions, Structured programming elements, Control statements: Branching, Jumping, Looping Arrays.

UNIT-III

Pointers, Functions: Inbuilt Functions, User defined Functions, Recursion, Storage Classes in C, dynamic memory management.

UNIT-IV

Strings, Structure and union, Reference variables, basics of searching and sorting techniques, file handling in C

References / Textbooks:

1. E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill (2002), 5th edition.
2. Stephen G. Kochan, Programming in C, Pearson Education (2015), 4th edition.
3. R.S. Salari, Application Programming in C, Khanna Book Publishing (2012), 4thedition.
4. Anshuman Sharma, Learn programming in C, Lakhanpal Publishers (2016), 7thedition.

Master of Science (Mathematics)(FYIP)

Semester–I

Session-2024-25

Course Title: Calculus Laboratory

Course Code: FMAP-1337

Examination Time: 3 Hours | Max. Marks: 25

Practical: 20

L T P | CA:5

0 0 1

Practical (Using any Software)

1. Plotting the graphs of elementary functions: e^{ax+b} $\sin(bx+c)$, $\log(ax+b)$, 1/(ax+b), $\sin(ax+b)$, $\cos(ax+b)$, $|ax+b|$ and to illustrate the effect of a and b on the graph.
2. Plotting the graphs of the polynomial of degree 4 and 5
3. Obtaining surfaces of revolution of curves and their area.
4. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic paraboloid, hyperbolic paraboloid using Cartesian coordinates.
5. Matrix operations (addition, multiplication, inverse, transpose), eigenvalues and eigenvectors.

Text Book:

1. Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, 9th Edition, Addison Wesley, 1998. (Scope as in Ch.1-7,9,11)

Reference Books:

1. Anton, H., Bivens, I., and Davis, S., Calculus, 12th Ed. John Wiley and Sons (Asia) P. Ltd, Singapore, 2002. (Scope as in Ch.0-3,6,10,12)
2. Courant, R.and John, F., Introduction to Calculus and Analysis (Vol I), Springer,1999.(Scopes in Ch.4)

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Mechanics Laboratory-1
Course Code: FMAP-1398

Examination Time: 3 Hours **Max. Marks: 25**
Practical: 20
CA:5

L T P
0 0 1

Practical's:-

1. To determine the value of acceleration due to gravity at a place with Kater's pendulum.

2. To find the moment of inertia of a fly wheel.

3. To find the moment of inertia of an irregular body about an axis through its centre of gravity with a torsion pendulum.

4. To study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations using objects of various geometrical shapes but of same mass)

5. Study of bending of beams and determination of Young's modulus.

6. Determination of Poisson's ratio for rubber.

Master of Science (Mathematics)(FYIP)

Semester–I
Session-2024-25
Course Title: Programming Laboratory- I
Course Code: FMAP- 1139

Examination Time: 3 Hours Max. Marks: 25
Practical: 20
L T P CA:5
0 0 1

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, and inverse of 3x3 matrix, elementary numerical methods and statistical methods.

FOUNDATIONCOURSE

Course Title: Foundation Course

Nature of Course: Audit Course (Value Added)

Course Duration: 30hours

Course intended for: Semester I students of undergraduate degree programs of all 25 streams.

Course Credits:2

Course Code: SECF-I

PURPOSE&AIM

This course has been designed to strengthen the intellectual foundation of all the new entrants in the college. One of the most common factors found in the students seeking admission in college after high school is the lack of an overall view of human history, knowledge of global issues,peaksofhumanintellect,social/politicalthinkersandinventors&discovererswhohaveimpacted human life. For a student, the process of transition from school to college is full of apprehension and skepticism regarding adapting themselves to new system. The Foundation Programme intends to bridge the gap between high school and college education and develop an intellectual readiness and base for acquiring higher education.

INSTRUCTIONALOBJECTIVES

- To enable the students to realize their position in the wholesaga of time and space
- to inculcate in them an appreciation of life, cultures and people across the globe
- to promote, in the students, an awareness of human intellectual history
- tomakethemresponsibleandhumaneworldcitizenssothattheycancarryforwardtherichlegacy of humanity

LEARNINGOUTCOMES

After the completion of this Audit course, students will be able to

- learn how past societies, systems, ideologies,governments,culturesandtechnologieswerebuilt, how they operated, and how they have changed
- understandhowtherichhistoryoftheworldhelpsustopaintadetailedpictureofwherewestandtoday
- understand the Vedic theism, UpanishadsPhilosophyanddoctrinesofJainism, BuddhismandSikhism
- acquireknowledgeofwomenrights andcouragetofacedaytodaychallenges
- acknowledge the changes in society, religion and literature in the renaissance period and theimportanceofempathy andcompassionforhumanity
- learn about the prominent Indians (Men and Women) who contributed significantly infreedom struggle,education, economic development and in the formationand evolutionofour nation
- understand meaning of race and how that concept has been used to justify exclusion,inequality, and violence throughout history and the origin of civil right movements tofightforequality, libertyand fraternity
- criticallyevaluatethesocio-politicalandeconomicissuesatgloballevelanditsimplications in thepresent
- upgradeandenhancelearningtechnologicalskillsandstrikingabalancebetweentechnologyandtheirwell being
- takepridein learningthe sagaof IndianPast CultureandHeritage
- understandtherich legacy ofKMVandits progressiveendeavours

MODULE	TITLE	CONTACT HOURS
I	**Introduction and Initial Assessment**	**2**
II	**The Human Story**	**3**
III	***The Vedas* and the Indian Philosophy**	**2.5**
IV	**The Journey of Woman The Story and the Dream**	**2.5**
V	**Changing Paradigms in Society, Religion &Literature**	**2.5**
VI	**Makers of Modern India**	**2.5**
VII	**Racism:Storyof theWest**	**2.5**
VIII	**Modern Worldata Glance:Political &Economic Perspective**	**2.5**
IX	**TechnologyVisa VisHuman Life**	**2.5**
X	**My Nation My Pride**	**2.5**
XI	**The KMV Experience**	**2.5**

XII	**Final Assessment, Feedback andClosure**	**2.5**

EXAMINATION

- **TotalMarks: 50(FinalExam:40;Internal Assessment:10)**
- Final Exam:multiplechoicequiz**.** Marks–20; Time: 1hour
- InternalAssessment:10(Assessment:6;Attendance: 4)
  Comparative assessment questions (medium length) in the beginning and close of the programme.Marks:3;Time:0.5 hour eachatthe beginningand end.

- Totalmarks: 50convertedtogradeforfinal result
- Gradingsystem:90%marks&above: Agrade
  80% - 89% marks: B grade70% - 79% marks: C grade60% - 69% marks: D grade50% - 59%marks:Egrade

  Below50%marks:F grade(Fail-mustgivethe examagain)

SYLLABUS

ModuleIBeingaHuman: Introduction&Initial Assessment

- Introductiontotheprogramme
- InitialAssessmentofthe studentsthroughwrittenanswers toa coupleofquestions

Module2TheHumanStory

- Comprehensiveoverviewofhumanintellectualgrowthrightfromthebirthofhumanhistory
- Thewisdom of theAncients
- DarkMiddleAges
- RevolutionaryRenaissance
- Progressivemoderntimes
- Mostmomentousturningpoints,inventionsanddiscoveries

Module3*TheVedas*and theIndian Philosophy

- Origin,teachingsandsignificanceof *TheVedas*

- UpnishadsandPuranas
- KarmaTheory of *TheBhagwad Gita*
- Maintenetsof Buddhism&Jainism
- Teachingsof GuruGranthSahib

Module4ChangingParadigmsinSociety,Religion &Literature

- Renaissance:TheAgeof Rebirth
- Transformationinhuman thought
- Importanceofhumanism
- Geocentricismtoheliocentricism
- Copernicus,Galileo,Columbus,DarwinandSaint Joan
- EmpathyandCompassion

Module5Woman:AJourneythroughtheAges

- Statusofwomen inpre-vedictimes
- WomeninancientGreekandRomancivilizations
- WomeninvedicandancientIndia
- Statusof women inthe Muslim world
- Womenin themodern world
- Crimesagainstwomen
- Womenlabourworkforceparticipation
- Womeninpolitics
- Statusof women-our dream

Module6MakersofModernIndia

- Earlyengagementofforeignerswith India
- Education:Thefirststeptomodernization
- Railways:Thelifelineof India
- RajaRamMohanRoy,Gandhi,Nehru,Vivekanand,SardarPatel etc.
- IndiraGandhi,MotherTeresa,HomaiVyarawala etc.
- TheWayAhead

Module7Racism:StoryoftheWest

- Europeanbeginningsofracism
- RacismintheUSA -JimCrowLaws
- MartinLutherKingJr.and thebattleagainstracism
- Apartheidand NelsonMandela
- Changingfaceofracisminthemodernworld

Module8ModernWorldataGlance:Political&EconomicPerspective

- Changingworldorder

- WorldWarI&II
- UNOandTheCommonwealth
- NuclearPowers;Terrorism
- EconomicScenario:IMF,WorldBank
- InternationalRegionalEconomicIntegration

Module9TechnologyVisa VisHumanLife

- Impactoftechnologyonmodern life
- Technologicalgadgetsand theirrolein ourlives
- Technologyandenvironment
- Consumerismandmaterialism
- Psychologicalandemotionalconsequencesoftechnology
- Harmonizingtechnologywithethicsandhumaneness

Module10MyNation MyPride

- IndianPastCultureand Heritage
- MajorDiscoveries(MedicinalandScientific)
- VedicAge
- ProminentAchievements
- Art,ArchitectureandLiterature

Module11TheKMVExperience

- RichLegacyof KMV
- Pioneeringroleinwomenemancipationand empowerment
- KMVContributionintheIndian FreedomStruggle
- Moral,culturalandintellectualheritageofKMV
- Landmarkachievements
- Innovativeinitiatives;internationalendeavours
- Vision,missionand focus
- Conductguidelinesforstudents

Module12FinalAssessment,Feedback&Closure

- Finalmultiple choicequiz
- Assessmentthroughthesamequestions askedinthebeginning
- Feedback abouttheprogrammefromthestudents
- Closureof theprogramme

PRESCRIBEDREADING

- ***TheHuman Story***publishedbyDawnPublications

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics) (FYIP)

Semester-II

Session- 2024-25

Master of Science (Mathematics) (FYIP) Semester-II										
Course Code	Course type	Course Title	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Max. Marks				Examination time in hours
						Total	Th	P	CA	
FMAL-2421/ FMAL-2031/ FMAL-2431	C	[1]Punjabi (Compulsory)/ [2] Basic Punjabi/ [3] Punjab History and Culture	2-0-0	2-0-0	2	50	40	-	10	3
FMAL-2102	AEC	Communicative English	2-0-0	2-0-0	2	50	40	-	10	3
FMAL-2333	DSC	Sequences and Seri	5-1-0	5-1-0	6	150	120	-	30	3
FMAL -2334	DSC	Algebra	5-1-0	5-1-0	6	150	120	-	30	3
FMAL-2135	C	Object Oriented Programming C++	3-0-0	3-0-0	3	75	60	-	15	3

FMAL-2336	SEC	Statistical Analysis Using Excel	1-0-0	1-0-0	1	25	20	-	5	3
FMAP-2137	C	Programming Laboratory –II	0-0-2	0-0-1	1	25	-	20	5	3
FMAP-2338	SEC	Statistical Analysis Using Excel Laboratory	0-0-4	0-0-2	2	50	-	40	10	3
VACD-2161	VAC	* Drug Abuse: Problem, Management and Prevention (Compulsory)	2-0-0	2-0-0	2	50	40	-	10	3
Total					25					

C-Compulsory

VAC-Value Added Courses

SEC-Skill Enhancement Courses

AEC-Ability Enhancement Courses

DSC-Discipline Specific Courses

Note:

[1]Domicle / Non Domicile of Punjab students who have studied Punjabi till 8th/ 10th class will study Punjabi (compulsory)

[2,3]The Non-Domicile of Punjab Students who have not studied Punjabi till 8th/10th class can choose either Basic Punjabi or Punjab History and Culture (PHC)

[2]Domicile of Punjab students who studied out of Punjab and did not study Punjabi till 8th / 10th class will have to study Basic Punjabi

[2]Domicile of Punjab students who have studied in Kendriya Vidyalaya of Punjab or any other school and due to any reason did not study Punjabi till 8th/10th class will have to study Basic Punjabi

* Marks of these papers will not be added in total marks. Grades will be provided.

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Basic Punjabi
Course Code: FMAL-2031
Course Outcomes

CO1: Ppd P/qDhnK L gSkD ns/ tos'A (BKt, gVBKt, fefonk, ftP/PD, fefonk ftP/PD, ;pzXe, :'ie ns/ ft;fwe)Bz{ gVQkT[D dk wB'oE ftfdnkoEhnK nzdo gzikph GkPk dh nwhoh dk ns/ pkohehnK Bz{ ;wMD bJh tZyo/ -tZyo/ f;XKsK dk ftek; eoBk j?/.

CO2: ftfdnkoEh gzikph tke pDso (;kXkoB tke, ;z:[es tke, fwPos tke, fpnkBhnk tke, gqPB tkue tke ns/ j[ewh tke) dh gfoGkPk ns/ fJ; dh pDso s'A ikD{ j'Dr/ ns/ T[BQK dh GkPk s/ geV wip{s j't/rh.

CO3: g?oQk ouBk ns/ ;zy/g ouBk dk wB'oE ftfdnkoEhnK dh p[ZXh B{z shyD eofdnK T[BK dh fbyD gqfsGk B{z T[ikro eoBk j?.

CO4: xo/b{ ns/ d|soh fuZmh gZso fbyD dk wB'oE ftfdnkoEhnK B{z fJ; ebk ftu fBg[zB eoBk j? lnykD ns/ w[jkto/ dh tos'A Bkb rZbpks ftu gogZesk nkT[Adh j?.fJj ftfdnkoEhnK dh rZbpks ftu fByko fbnkT[D dk ezw eoBr/.

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Basic Punjabi
Course Code: FMAL-2031

smW: 3 GMty **Maximum Marks : 50**

Theory : 40

CA : 10

nze tzv ns/ gohfyne bJh jdkfJsK

1H gqPB gZso d/ uko ;?ePB j'Dr/.;?ePB A-D sZe d/ gqPB :{fBN I-IV ftu'A g[ZS/ ikDr/. jo ;?ePB ftu d' gqPB g[ZS/ ikDr/.

2H ftfdnkoEh B/ eZ[b gzi gqPB eoB/ jB. jo ;?ePB ftu'A fJe gqPB eoBk bkIwh j?. gzitK gqPB fe;/ th ;?ePB ftu'A ehsk ik ;edk j?.

3H jo/e gqPB d/ 8 nze jB.

4H g/go ;?ZN eoB tkbk i/eo ukj/ sK gqPBK dh tzv nZr'A tZX s'A tZX uko T[g gqPBK

ftu eo ;edk j?.

gkmeqw

:{fBN-I

Ppd P/qDhnK L gSkD ns/ tos'A (BKt, gVBKt, fefonk, ftP/PD, fefonkftP/PD, ;pzXe,

:'ie ns/ ft;fwe)
16 nze

:{fBN-II

gzikphtkepDso L w[ZYbhikDgSkD

(T) ;kXkoBtke, ;z:[estke ns/ fwPostke (gSkD ns/ tos'A)

(n) fpnkBhnktke, gqPBtkuetke ns/ j[ewhtke (gSkD ns/ tos'A)
16 nze

:{[fBN-III

g?oQkouBk

;zy/g ouBk

16 nze

:{fBN-IV

fuZmhgZso (xo/b{ ns/ d|soh)

nykD ns/ w[jkto/ (fb;N Bkb BZEh j?) 16 nze

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Punjabi Compulsory
Course Code: FMAL-2421

COURSE OUTCOMES

CO1:nkX[fBe fJeKrhg[[[;se Bz{ gVQkT[D dkwB'oEftfdnkoEhnKnzdofJeKrhgqshfdbu;gh, ;{M Bz{ g?dkeoBk j?.

CO2nkX[fBe fJeKrh g[[[;se Bz{ gVQkT[D dk wB'oE ftfdnkoEhnK nzdo fJeKrh gqsh fdbu;gh, ;{M Bz{ g?dk eoBk j?.

CO3:w[jkto// / nykDdh tos'A Bkb rZbpks ftu gogZesk nkT[Adh j?.fJj ftfdnkoEhnK dh rZbpks ftu fByko fbnkT[D dk ezw eoBr/.

CO4:Ppd Pq/DhnKBz{ gVQkT[D dkwB'oEftfdnkoEhnKnzdogzikphGkPk dh nwhohdk ns/ pkohehnKBz{ ;wMDbJhtZyo/ -tZyo/ f;XKsKdkftek; eoBk j?.

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Punjabi Compulsory
Course Code: FMAL-2421

;wK L 3 xzN/ **Maximum Marks: 50**
L-T-P **Theory : 40**
2-0-0 **CA :10**

nze tzv ns/ gohfyne bJh jdkfJsK

1H gqPB gZso d/ uko ;?ePB j'Dr/.;?ePBA-DsZe d/ gqPB :{fBNI-IV ftu'A g[ZS/ ikDr/. jo ;?ePB ftu d' gqPB g[ZS/ ikDr/.

2H ftfdnkoEh B/ eZ[b gzi gqPB eoB/ jB. jo ;?ePB ftu'A fJe gqPB eoBk bkIwh j?. gzitK gqPB fe;/ th ;?ePB ftu'A ehsk ik ;edk j?.

3H jo/e gqPB d/ 8 nze jB.

4H g/go ;?ZN eoB tkbk i/eo ukj/ sK gqPBK dh tzv nr'A tZX s'A tZX uko T[g gqPBKftu eo ;edk j?.

gkmeqw ns/ gkm g[;seK

:{fBN-I

nkX[fBe fJeKrh, ;zgkde o"PB bkb nj{ik, r[o{ BkBe d/t :{Bhtof;Nh, nzfwqs;o

;[jkr, I|oBkwk, fJZe n?stko fJeKrhnK gVQkJhnK ikDrhnK.

(;ko,ftPkt;s{)

8 nze

:{fBN-II

nkX[fBe fJeKrh, ;zgkde o"PB bkb nj{ik, r[o{ BkBe d/t :{Bhtof;Nh, nzfwqs;o
pzp e/;, i[ZshnK dk I'Vk, eZu dk riok fJeKrhnK gVQkJhnK ikDrhnK.
(;ko,ftPk t;s{)

8 nze

:{fBN-III

(T) w[jkto// /nykD
(n) xo/b{ fuZmh gZso8nze

:{fBN-IV

(T) PpdPq/DhnK L BKt,gVBKt,fefonk,ftP/PD
(n) PpdPq/DhnKL fefonkftP/PD,;zpzXe,:'ie,ft;fwe8 nze

Master of Science (Mathematics)(FYIP)

Semester–II

Session- 2024-25

Course Title: Punjab History and Culture

Course Code: FMAL-2431

COURSE OUTCOMES

After completing Semester II and course on Ancient History of Punjab students will be able to understand:

CO 1: The reasons and impact of Alexander's invasions and to comprehend various factors leading to rise and fall of empires and emergence of new dynasties and their administration specifically of Maurya rule in general and Ashok in particular

CO 2: art and architecture of Gupta period and the Indo-Greek style of architecture under Gandhara School

CO 3: To have an insight into the socio-cultural history under Harshvardhan and punjab under the stated period

CO 4: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Greek Art and Architecture in Punjab

Master of Science (Mathematics)(FYIP)

Semester–II

Session- 2024-25

Course Title: Punjab History and Culture

Course Code: FMAL-2431

Examination Time: 3 Hours **Max. Marks: 50**
Credits L-T-P: 2-0-0 **Theory: 40**
Contact Hours: 2 Hrs/Week **CA: 10**

Instructions for the Paper Setter:

1. Question paper shall consist of four Units
2. Examiner shall set 8 questions in all by selecting Two Questions of equal marks from each Unit.
3. Candidates shall attempt 5 questions in 600 words, by at least selecting One Question from each Unit and the 5th question may be attempted from any of the four Units.
4. Each question will carry 8 marks

Unit-I

1. Alexander's Invasion's and Impact
2. Administration of Chandragupta Maurya with special reference to reforms introduced by Ashok

Unit-II

3. The Kushans: Gandhar School of Art
4. Gupta Empire: Golden Period-Social and cultural life, Art and Architecture)

Unit-III

5. The Punjab under Harshvardhana-**Society and Religion During the time of Harshvardhana**
6. Socio-cultural History of Punjab from 7th to 1000 A.D.

UNIT IV

7. Development of Languages and Education with Special reference to Taxila
8. Development to Art and Architecture

Suggested Readings

- B.N. Sharma: *Life in Northern India*, Delhi. 1966
- Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
- L. M Joshi (ed), *History and Culture of the Punjab*, Art-I, Punjabi University, Patiala, 1989 (3rd edition)
- L.M. Joshi and Fauja Singh (ed.), *History of Punjab*, Vol.I, Punjabi University, Patiala, 1977.

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Communicative English
Course Code: FMAL-2102

Course Outcomes

At the end of this course, students will be able to:

CO1: distinguish the main points from the supporting details and the irrelevant information from the relevant one through Note-Taking

CO2: learn the skills and strategies of effective writing by paragraph writing

CO3: enhance their reading and analyzing power of texts through guided reading through the study of “Making Connections” by Kenneth J. Pakenham

CO4: be acquainted to the techniques of effective essay writing

Master of Science (Mathematics)(FYIP)

Semester–II
Session- 2024-25
Course Title: Communicative English
Course Code: FMAL-2102

Examination Time: 3 Hours | Max. Marks: 50
Theory: 40
L T P | CA:10
2 0 0

Instructions for Paper Setters:

Eight questions of equal marks (08 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four).Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Practical question on Note Making, Summarizing and Abstracting as given in The Written Word by Vandana R. Singh

Unit-II

Practical question on Paragraph writing as prescribed in The Written Word by Vandana R. Singh

Unit-III

Theoretical questions based on ABC of Good Notes as prescribed in The Written Word by Vandana R. Singh, Unit-III from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition

Unit-IV

Practical question on Essay writing from The Written Word by Vandana R. Singh,
Unit - IV from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition.

Text books:

- The Written Word by Vandana R. Singh, Oxford University Press, New Delhi
- Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, second edition.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Sequences and series
Course Code: FMAL-2333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate an understanding of sequences and series and their convergence, Cauchy criterion, sub sequence and algebra of limit of sequences.

CO 2: Know and describe the behaviour of Infinite series using various tests like comparison test, Cauchy Integral test. Ratio test, Raabe's test.

CO 3: Distinguish between the absolute convergence and conditional convergence.

CO 4: Manage to solve the problem related to Fourier series expansion, Fourier series for even and odd functions and half range series.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Sequences and series
Course Code: FMAL-2333

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
L T P | CA: 20
5 1 0

Instructions for Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions.

Unit-I

Sequence, sub sequence, bounded sequences, monotone sequences, convergence, Cauchy criterion, algebra of limit of sequences (proofs with ε-N rigor), Sandwich Theorem.

Unit-II

Infinite series, Sequences of partial sums, convergence and divergence of series, series of non-negative terms, comparison test, Limit Comparison test, Cauchy's nth root test, Cauchy's Condensation test, Cauchy's Integral test. Ratio test, Raabe's test (all tests with proofs).

Unit-III

Logarithmic test and Gauss test, Alternating series, Leibnitz Test, absolute and conditional convergence, Convergence of Power Series, Taylor Series.

Unit-IV

Periodic functions, trigonometric series, Fourier series expansion, Fourier series for even and odd functions, half range series.

Text Book:

George B. Thomas and Ross L. Finney, Calculus and Analytic Geometry, Pearson publication, 9th Edition, 1998.

Reference Books:

1. S. C. Malik and S. Arora, Mathematical Analysis, New Age International Publishers, New Delhi, 2nd Edition, 2005.

2. Sudhir R. Ghorpade and B.V. Limaye, A course in calculus and real analysis, Springer, 2006.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Algebra
Course Code: FMAL-2334

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of De Moivre's theorem & its applications. Identify One to one correspondence and cardinality of a set.

CO2: Understand the concepts of basis and dimension of vector space.

CO3: Understand matrix representation of a linear transformation

CO 4: Obtain Eigen values, Eigen vectors, minimal and characteristic equation of a matrix and to apply it in advanced dynamics and electric current.

Master of Science (Mathematics)(FYIP)
Semester–II
Session-2024-25
Course Title: Algebra
Course Code: FMAL-2334

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
L T P | CA: 20
5 1 0

Instructions for Paper Setters:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions.

Unit-I

Polar representation of complex numbers, nth roots of unity, de Moivre's theorem, Invertible functions, One to one correspondence and cardinality of a set, Principles of Mathematical Induction.

Unit-II

Vector spaces, subspaces, sums of subspaces, linearly independent and dependent vectors, linear span, subspace generated by a subset, basis and dimension.

Unit-III

Linear transformations, null space and range space of a linear transformation, rank and nullity of a linear transformation, matrix representation of a linear transformation.

Unit-IV

Elementary matrix operations and Elementary matrices, Row rank and Column rank of a matrix and their equality, System of linear equations over a field, Characteristic polynomial of a matrix, Cayley-Hamilton Theorem, Eigen values and Eigen vectors.

Text Book:

S. Axler, Linear Algebra Done Right, Springer, Second edition, 1997.

Reference Books:

1. S. H. Friedberg, A.J. Insel and L.E. Spence., Linear Algebra, PHI Learning Pvt. Ltd, New Jersey, 1979
2. V. Sahai and V. Bist., Linear Algebra, Narosa Publishing House Pvt. Ltd, Delhi, 2013
3. Andreescu, T. and Andrica, D. ,Complex Numbers from A to Z, Birkhauser,2006.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Object Oriented Programming C++
Course Code: FMAL-2135

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

CO1: Comprehend the concepts of Object-Oriented Programming Paradigm.

CO2: Identify the use of access specifiers and different types of constructors in class.

CO3: Apply function and operator overloading.

CO4: Comprehend different types of inheritance and polymorphism.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Object Oriented Programming C++
Course Code: FMAL-2135

Examination Time: 3 Hours | Max. Marks: 75
Theory:60
L T P | CA:15
3 0 0

Instructions for the Paper Setters:

Eight questions of equal marks (12 Marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT–I

Getting Started: Introduction. AbriefhistoryofC++,Variable,Constant ,Expression, Statements, Comments and keywordsofC++.

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

Input/Output Statements:Inputting using cin and out putting using cout statements, Preprocessordirectives.

Basic Program construction: A complete C++ program: invoking Turbo C++, naming your program, usingthe 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.

UNIT–II

Programming Paradigms: Introduction to the object oriented approach towards programming by discussing Traditional, Structured Programming methodology.

Objects & Classes: Object Definition, Instance, Encapsulation, Data Hiding, Abstraction, Inheritance, Messages, Method, Polymorphism, Classes.

Object Oriented Programming using C++: Characteristics of OOP, Overview of C++, Objects

and Classes, Member functions and data, private & public, constructor & destructor, Constructor Overloading, Types of Constructors.

UNIT-III

Operator Overloading: Overloading unary operators, Overloading binary operators, Data conversion, Pit-falls operator overloading and conversion.

Function Overloading: Function Overloading, Default Arguments, Ambiguity in Function Overloading.

UNIT–IV

Inheritance: Concept of inheritance, Base & derived classes, Access Specifiers, Class Hierarchies, Types of Inheritance with examples.

Polymorphism: Virtual functions, friend functions, static function, this pointer, polymorphism, Types of Polymorphism with examples, Templates

References / Textbooks:

1. Herbertt Schildt, C++: The Complete Reference, Tata McGraw-Hill Education India, 4th Edition.
2. Bjarne Stroustrup, The C++ Programming Language, Addison – Wesley Professional (2013), 4th Edition
3. G.S. Baluja, C++ Program Design (w/CD), Khanna Book Publishing Company (2015), 2nd edition.
4. Stanley Lippman, Josee Lajoie, Barbara Moo, C++ Primer, Addison-Wesley Professional (2012), 5th edition.
5. Richard Johnsonbaugh and Martin Kalin, Object Oriented Programming in C++, Pearson Education (1999), 2nd Edition

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Statistical Analysis using Excel
Course Code: FMAL-2336
Course outcomes:

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

CO:1 introduce the meaning of statistics, Collection, presentation and interpretation of data with the help of excel.

CO:2 To Enhance the knowledge of Measures of dispersion, Skewness and Bowley's co-efficient of skewness and Kurtosis.

CO:3 To comprehend the concept of Correlation and its methods with rank correlation coefficient.

CO:4 To understand the concept of Linear Regression, regression Yon X, regression X on Y, Regression Coefficient, Difference between regression and Correlation, and calculation of these using MS excel.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Statistical Analysis using Excel
Course Code: FMAL-2336

Examination Time: 3 Hours | Max. Marks: 25
Theory: 20
CA: 5

L T P
1 0 0

Instructions for Paper Setters:

Eight questions of equal marks (4 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions.

Unit-I

Introduction to statistics, functions of statistics, collection of data, presentation of data, tabulation of data, charting of data, introduction to excel/spss, graphs in excel, measures of central tendency-, mean, median - meaning and computation, mode- meaning and computation, weighted average mean, geometric mean and harmonic mean.

Unit-II

Measures of dispersion, types of dispersion- range, quartile deviation, mean deviation, standard deviation, co-efficient of variation. Skewness- Karl Pearson co-efficient of skewness, Bowley's co-efficient of skewness and Kurtosis.

Unit-III

Correlation, Types of correlation, positive, negative, linear. methods of correlations – Karl Pearson's Co-efficient of correlation, rank correlation coefficient.

Unit-IV

Regression analysis- Linear Regression, regression Yon X, regression X on Y, Regression Coefficient, Relations between regression coefficients and correlation coefficients, Difference between regression and Correlation, Calculation of these using MS excel.

Reference Books:-

1. SC Gupta, Fundamentals of Mathematical Statistics, Himalaya Publication.
2. Data Analysis with Microsoft Excel by K. Berk, Partrick Carey.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Programming Laboratory-II
Course Code: FMAP- 2137

Examination Time: 3 Hours | Max. Marks: 25
Practical: 20
CA:5

L T P
0 0 1

Lab based on Object Oriented Programming C++ (FMAL-2135)

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25
Course Title: Statistical Analysis Using Excel Laboratory
Course Code: FMAP-2338

Examination Time: 3 Hours | Max. Marks: 50
Practical: 40
CA: 10

L T P
0 0 2

List of Practicals (using excel)

1. Introduction of basics of excel and functions such as 'sum', 'count', 'countif', 'max', 'min','sort' etc.
2. To prepare result from the data on marks and number of credits in a given number of courses of a class based on total marks, marks obtained, percentage of marks obtained, grades, and determine SGPA for each student.
3. Create frequency distribution table; plot histogram, bar chart, pie chart, etc.
4. Plotting two dimensional graphs.
5. To find measures of central tendency for a given data.
6. To find measures of dispersion for a given data.
7. To find measures of skewness and kurtosis for a given data.
8. To find Karl Pearson Coefficient of correlation and rank correlation coefficient for a givendata.
9. To find regression coefficient for bivariate data and plotting regression lines.

Reference Books:-

1. S. C. Gupta, Fundamentals of Mathematical Statistics, Himalaya Publication.
2. K. Berk, Partrick Carey, Data Analysis with Microsoft Excel.

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25

Course Title: Drug Abuse: Problem, Management and Prevention

Course Code: VACD-2161

Course Outcomes

After completing the course the students will be able to:

CO1. Learn how to include factual data about what substance abuse is; warning signs of addiction; information about how alcohol and specific drugs affect the mind and body;

CO 2. Focus on substance abuse education- is teaching individuals about drug and alcohol abuse and how to avoid, stop, or get help for substance use disorders.

CO3. Learn how to be supportive during the detoxification and rehabilitation process

CO 4. Understand that substance abuse education is important for students alike; there are many misconceptions about commonly used legal and illegal substances, such as alcohol and marijuana

Master of Science (Mathematics)(FYIP)

Semester–II
Session-2024-25

Course Title: Drug Abuse: Problem, Management and Prevention

Course Code: VACD-2161

Time: 3Hrs | Max. Marks: 50

Theory:40 | CA:10

Credits: L-T-P: 2-0-0

Contact Hours: 2 Hrs/ Week

Instructions for the Paper Setter:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Meaning of Drug Abuse:

(i)Meaning, Nature, Types and Extent of Drug Abuse in India and Punjab.

(ii)Consequences of Drug Abuse for:

Individual: Education, Employment, Income.
Family: Violence.
Society: Crime, Social Disorganization

UNIT-II

MANAGEMENT OF DRUG ABUSE:

(i) Medical management: medication for treatment and to withdrawal effects.

(ii) Psychiatric Management: Counseling, Behavioral and Cognitive therapy.

UNIT-III

Prevention of Drug abuse:

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

(ii) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students

UNIT-IV

Controlling Drug Abuse:

(i) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials

Suggested Readings:

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: SagePublications.

4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: MittalPub.

5.Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.

6.National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences,2004.

7.Sain, Bhim 1991, *Drug Addiction Alcoholism,* Smoking obscenity New Delhi: Mittal Publications.

8.Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab*: A Sociological Study. Amritsar: Guru Nanak Dev University.

9.Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi:Shipra.

10.Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention andCessation,*Cambridge University Press.

FACULTY OF SCIENCES

SYLLABUS

Master of Science (Mathematics)(FYIP)

(Semester: III -IV)

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR

(Autonomous)

Master of Science (Mathematics) (FYIP)

Session: 2024-25

Programme Specific Outcomes

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

PSO1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theorem of Mathematics and their applications in the real world to an advanced level, enhance career prospects in a huge array of field suitable to succeed at an entry level position in Mathematics post graduate program.

PSO2: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics, Chemistry, Electronics, Computer Science and Economics.

PSO3: Create and develop Mathematical software application using a systematic approach & apply discrete Mathematical concept to practical application.

PSO4: Demonstrate knowledge of Calculus I & II, Matrices and Theory of Equations, Analytical and Solid Geometry, Statics & Tensor Calculus and able to apply this knowledge to analyze a variety of Mathematical Phenomena.

PSO5: Demonstrate knowledge of physical chemistry & apply this knowledge to analyze a variety of chemical phenomena & will be able to interpret and analyze quantitative data.

PSO6: Understand and demonstrate the knowledge of Mechanics, area, volume and displacement with differential equation of the orbit.

PSO7: Understand the basic concepts and basic principles of Demand and Supply, Measurement of Price Elasticity of Demand and apply Economic theories to derive cost function from Production Function.

PSO8: Learn implications of Revenue curves and their mutual relationships.

PSO9: Develop statistical approach and mathematical thinking among students to problem solving on a diverse variety of disciplines.

PSO10: Have knowledge of computer fundamentals, able to handle practical programming problems using C and analyze large volume of data using various statistical techniques

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics) (FYIP)

Semester-III

Session- 2024-25

Master of Science (Mathematics) (FYIP) Semester-III										
Course Code	Cour type	Course Title	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Max.Marks				Examination time in hours
						Total	Th	P	CA	
FMAL -3331	C	Calculus III	3-1-0	3-1-0	4	100	80	-	20	3
FMAL -3332	C	Ordinary Differential Equations and Special Functions	3-1-0	3-1-0	4	100	80	-	20	3
FMAL - 3333	C	Probability Theory	3-1-0	3-1-0	4	100	80	-	20	3
FMAL - 3334	C	Linear Algebra	3-1-0	3-1-0	4	100	80	-	20	3
FMAM - 3135	C	Python Programming	3-0-2	3-0-1	4	100	50	30	20	3+3
AECE-3221	AC	* Environmental Studies (Compulsory)	3-0-2	3-0-1	4	100	60	20	20	3
SECP-3512	AC	* Personality Development	1-0-0	1-0-0	1	25	20	-	5	1
Total					20	500				

Note:

* Marks of these papers will not be added in total marks and only grades will be provided

C-Compulsory

AC-Audit Course

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Calculus III

Course Code: FMAL-3331

Course Outcomes

After passing this course, the students will be able to:

CO1: Evaluate Partial derivatives, Limits and continuity, Homogenous Functions, Euler's Theorem and recognize the various notations used in partial derivatives.

CO2: Analyse functions using Chain Rule, Jacobians, Directional Derivatives and Gradient Vectors.

CO3: To find optimization value for a function of two variables.

CO4: Apply double integration technique in finding the area of a region and triple integrals to find volume.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Calculus III

Course Code: FMAL-3331

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 80

31 0 | CA: 20

Instructions for Paper Setter

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Real Valued functions of several variables with emphasis on functions of two variables, Limits and continuity, Partial derivatives, Homogeneous Functions, Euler's Theorem

Unit II

Total differentiation, Differentiation of composite functions, Implicit functions, Chain Rule, Jacobians, Directional Derivatives, Gradient Vectors.

Unit III

Saddle Points, Maxima and Minima of functions of two variables, Lagrange's Multiplier method, Higher dimensional analogues of Lagrange's Mean value Theorem and Taylor's theorem for functions of two variables.

Unit IV

Double integration over rectangular and non-rectangular regions, change of order of integration, double integration in polar co-ordinates, triple integration over parallelepiped and other solid regions, Applications of double and triple integrals to area, volume, centre of gravity, moment of inertiaetc.

Text Book:

George B. Thomas and Ross L. Finney, Calculus and Analytic Geometry, Pearson publication, 9th Edition, 1998. (Scope as in Ch.12-13)

Reference Books:

1. Sudhir R. Ghorpade and B.V. Limaye, A course in calculus and real analysis, Springer, 2006.
2. E. Kreyszig, Advanced Engineering Mathematics, Wiley Publication, 10th Edition, 2011.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Ordinary Differential Equations and Special Functions

Course Code: FMAL-3332

Course Outcomes

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

CO1: Identify differential equation, its order and degree, exact differential equations. Solve equations of first order and higher degree and demonstrate the concept of Linear Differential equation with constant coefficients.

CO2: Demonstrate the concept of linear differential equations with variable coefficients and find its solution using power series method

CO 3: Understand the concept of Bessel's Function with their properties like Orthogonal Property, Recurrence Relations, and Generating Function etc. and to recognize some of the Partial Differential Equations that can be solved by application of Bessel Function.

CO 4: Understand the concept of Legendre's Function with their properties like Orthogonal Property, Recurrence Relations, Rodrigue's formula and Generating Function etc. and to recognize some of the Partial Differential Equations that can be solved by application of Legendre Function.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Ordinary Differential Equations and Special Functions

Course Code: FMAL-3332

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 80

31 0 | CA: 20

Instructions for Paper Setter:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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. Linear differential equations with constant coefficients.

Unit II

Linear differential equations with variable coefficients, Variation of Parameters method, reduction method, series solutions of differential equations. Power series method, Bessel and Legendre equations (only series solution).

Unit III

Bessel's Functions: Recurrence relations, Generating Function, Orthogonal Property, Trigonometric Expansions involving Bessel's Functions.

Unit –IV

Legendre's Functions: Recurrence Relations, Generating Function, Rodrigue's Formula, Orthogonal Property, Trigonometric Series, Laplace definite integrals, Christoffel's expansion

Text Book:

M.D.Rai Singhania, Ordinary and Partial Differential Equations, S Chand Publishing, New Delhi, 11th Edition, 2009.

Reference Books:

1. E.A. Coddington, An Introduction to Ordinary Differential Equations, Dover Publications, Inc., New York.
2. D.A.Murray, Introductory Course in Differential Equations, Orient Longman Private Limited, Hyderabad, 11th edition,2003.
3. G.F.Simmons, Differential Equations, McGraw Hill Education, 2nd edition, 2017.
4. E.D. Rainville, Special Functions, The Macmillan Company, New York.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Probability Theory

Course Code: FMAL-3333

Course Outcomes

After passing this course, the students will be able to:

CO1: Translate the realworld problem into probability based mathematical model. They will be able to analyze, examine and control real time data.

CO2: Distinguish between discrete and continuous random variable primarily in their application and usage in real life.

CO3: Apply general properties and applications of expectation, variance and moments.

CO4: Identify the characteristics of different continuous and discrete distribution. In

particular they will be able to differentiate between widely used events with Binomial and Poisson distribution; and apply Normal distribution in real time applications.

:

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Probability Theory

Course Code: FMAL-3333

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 80

3 1 0 | CA: 20

Instructions for Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.The question paper must contain 30% of the article/theory from the syllabus.

Unit I

Measures of central tendency: Mean, Median, Mode, and Measure of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance, Skewness, Kurtosis, Sample Space, Probability axioms, Probability on finite sample space, Conditional probability and Independence, Baye's theorem.

Unit II

Random variables, Probability mass function, Probability density function, Distribution function, Function of a random variable and its distribution. Multiple random variables, Joint distribution, Marginal and Conditional distributions.

Unit III

Mathematical Expectation, Conditional Expectation, Variance, Covariance, Moments, Moment generating function, Chebychev's inequality, Bernoulli's Law of large numbers.

Unit –IV

Discrete Probability Distributions: Bernoulli, Binomial, Poisson, Negative Binomial, Geometric distribution. Continuous Probability Distributions: Uniform, Normal, Gamma, Beta, Exponential distribution (For All distributions only Mean, Variance, Moment Generating Function)

Text Book:

S.C Gupta and V.K Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 11th edition, 2018. (Scope in Chapters 2-8).

Reference Book:

A.M. Mood , F.A. Graybill , D.C. Boes: Introduction to the Theory of Statistics, Chennai: McGraw Hill Education (India) Pvt. Ltd, 3rd edition, 2017.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Linear Algebra
Course Code: FMAL-3334

Course Outcomes

After passing this course, the students will be able to:

CO1: Express the algebraic concepts such as binary operation, groups, rings

and fields. Define a vector space and subspace of a vector space and check the linear dependence and linear independence of vectors

CO2: To understand the concepts of basis and dimension of vector space.

CO3: To understand matrix representation of a linear transformation

CO4: To find rank and normal form of a matrix, invertible matrix and to solve system of linear equations.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Linear Algebra
Course Code: FMAL-3334

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80
31 0 | CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Definition and examples of vector spaces, properties of vector spaces, subspaces, examples ofsubspaces, sums and direct sums of subspaces, finite dimensional vector space: span of a list of vectors, linear independence and dependence of vectors.

Unit II

Basis of a vector space, extension of a list to a Linear Independent basis, reduction of a spanning list to a basis, direct complement of subspace, dimension theorems, quotient space, dimension of a quotient space.

Unit III

Linear maps, Null space, Range space, Rank-Nullity Theorem, Matrix of a linear map, invertibility of a linear map, algebra of linear maps.

Unit IV

Elementary matrix operations, elementary matrices, rank of a matrix, equality of row and column rank, normal form for a matrix, invertible matrix as a product of elementary matrices, system of linear equations

Text Book:

S. Axler, Linear Algebra Done Right, Springer, Second edition, 1997.

Reference Books:

1. S. H. Friedberg, A.J. Insel and L.E. Spence., Linear Algebra, PHI Learning Pvt. Ltd, New Jersey, 1979

2. V. Sahai and V. Bist., Linear Algebra, Narosa Publishing House Pvt. Ltd, Delhi, 2013

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Python Programming

Course Code: FMAM-3135

Course Outcomes:

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

CO1: Comprehend basics of Python programming like operators, data types, I/O, etc.

CO2: Apply various control statements of Python Programming Language for designing solutions to different real world problems.

CO3: Implement various built-in and user defined function, packages and modules to solve mathematical problems.

CO4: Apply different matrix operations using NumPy and perform file manipulations.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Course Title: Python Programming

Course Code: FMAM-3135

Examination Time: (3+3) Hours | Max. Marks: 100
Theory: 50
L-T-P: 3-0-1 | Practical: 30
Credit: 4 | CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (10 marks each), (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNITI

Introduction to python and Setting up the Python development Environment, Basic syntax, interactiveshell, editing, saving, and running a script, Concept of data types, Declaring and using Numeric datatypes: int, float, complex Lists and Tuples and their basic operations, Python console Input / Output.Arithmetic operators and expressions, Conditions, Comparison operators, Logical Operators, Is and Inoperators.

UNITII

Calculation of area, surface area and volume of geometrical objects. String Handling, Unicode strings, Strings Manipulation: - compare strings, concatenation of strings,slicing strings in python, converting strings to numbers and vice versa. Dictionaries Controlstatements: if-else, Nested If-Else, Loops (for, while) Loop manipulation using pass, continue, breakand else.

UNITIII

Built in function and modules in python, user defined functions, passing parameters, arguments and return values; formal vs actual arguments, Lamda function in python, Recursion, organizing python codes using functions, modules and external packages.

Math Module: Constants, Arithmetic functions, Power functions, Logarithmic functions, Trigonometric and Angular functions.

UNITIV

Matrix operations using NumPy array (Multiplication. Addition, matrix multiplication, inverse, determinant, adjoint, Eigenvalues, etc).

Files: manipulating files and directories, OS and Sys modules; creating and reading a geometric file (csv or tab separated) understanding readfunctions, read(), readline() andreadlines(), Understandingwritefunctions, write() and writelines(), Manipulatingfile pointerusingseek. Introduction to graphic. Plotting graphs and objects.

References / Textbooks:

1. Mark Lutz, Learning Python, O'Reilly Media, 2013.
2. David Beazley, Python cookbook, O'Reilly Media, 2013.
3. David Beazley, Python Essential Reference, Addison-Wesley Professional, 2009.
4. John Zelle, Python programming: An Introduction to Computer Science, Franklin, Beedle & Associates Inc, 2004.
5. Alex Mortelli, Python in a Nutshell, O'Reilly Media, 2006.

Note: The latest editions of the books should be followed.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Environmental Studies

Course Code: AECE-3221

COURSEOUTCOMES:

- CO1) Understand the concept and need of environmental education.
- CO2) Understand the role of an individual in conservation of natural resources.
- CO3) Learn about role of major Ecosystem and their conservation.
- CO4) Develop desirable attitude, value and respect for protection of Biodiversity.
- CO5) Learn about the control measure of pollution and solid waste management.
- CO6) Understand the role of different agencies in the protection of environment.
- CO7) Knowledge regarding welfare programmes and Human rights.
- CO8) Knowledge about the applied value of environmental studies.

Master of Science (Mathematics) (FYIP)

Semester–III

Session: 2024-25

Environmental Studies

Course Code: AECE-3221

Examination Time: 3Hrs. Max. Marks: 100

Theory: 60

Project Report: 20

CA: 20

Instructions for the Paper Setter:

The question paper should carry 60 marks. The structure of the question paper being: Part-A, Short answer pattern – 20 marks

Attempt any five questions out of seven. Each question carries 4 marks. Answer to each question should not exceed 2 pages

Part-B, Essay type with inbuilt choice – 40 marks

Attempt any five questions out of eight. Each question carries 8 marks. Answer to each question should not exceed 5 pages.

Unit 1

The multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness

Unit 2

Natural Resources: Renewable and non-renewable resources:

Natural resources and associated problems.

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

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

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

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

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

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

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

Unit 3

Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit 4

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Unit 5

Environmental Pollution

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit 6

Social Issues and the Environment

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products

- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act

- Issues involved in enforcement of environmental legislation
- Public awareness

Unit 7

Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Unit 8

Field Work

- 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

References:

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.

2. Down to Earth, Centre for Science and Environment, New Delhi.

3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.

4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.

5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.

6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.

7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.

8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.

9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi

10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi

PERSONALITY DEVELOPMENT
Course Code: SECP-3512

PURPOSE
To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES
- To re-engineer attitude and understand its influence on behaviour.
- To develop inter-personal skills and be an effective goal-oriented team player.
- To develop communication and problem solving skills.
- To develop professionals with idealistic, practical and moral values.

LEARNING OUTCOMES
- On completion of the course, students will be able to hone their personality by
- Realisation of the importance and incorporation of positive thinking and attitude in life
- Enhancement of self confidence and analysis of self capabilities
- Learning the different communication skills for self expression
- Effective use of time to combat stress and increase in productivity
- Enhancing personality by physical grooming and fitness
- Understanding the role of design principles and appropriateness of apparel
- Incorporating social etiquettes in daily life and conduct
- Excelling in decision making and leadership qualities

CURRICULUM

MODULE	TITLE	HOURS
1.	Positive Thinking & Attitude	2
2.	Self Analysis & Self Confidence	2
3.	Communication Skills	10
	• Basic Communication Skills • Body Language • Interview Skills • Résumé Writing • Group Discussion • Telephone and E-mail etiquette • Public Speaking	
4.	Time Management	2
5.	Stress and Conflict Management	2

6.	Physical Fitness and Personal Grooming	2
7.	Appropriateness of Apparel	2
8.	Social Etiquette	2
9.	Decision Making process & Problem Solving Skills • Leadership Skills • Goal Setting • Motivation	5
10.	Closure	1

EXAMINATION

1. Total marks of the course will be 25 (Final Examination: 20 Marks; Internal Assessment: 5Marks)
2. The pattern of the final examination will be multiple choice questions. 25 multiple choice type questions will be set. The student shall attempt 20 questions. Each question will carry 1 mark (20 X 1 = 20). Total time allotted will be 1 hour.
3. Internal Assessment will consist of Attendance: 2 Marks, Internal: 3 Marks.(Total Internal Assessment:5 Marks)

SYLLABUS

MODULE 1: Positive Thinking & Attitude

- Factors Influencing Attitude
- Essentials to develop Positive Attitude
- Challenges &lessons from Attitude

MODULE 2: Self Analysis & Self Confidence

- Who am I
- Importance of Self Confidence
- SWOT Analysis

MODULE 3: Communication Skills

(i) Basic Communication Skills

- Speaking skills
- Listening skills
- Presentation skills

(ii) Body Language

- Forms of Non-Verbal Communication
- Interpreting body language clues
- Effective use of body language

(iii) Interview Skills

- Type of Interviews
- Ensuring success in job interviews
- Appropriate use of Non-verbal Communication

(iv) Résumé Writing

- Features
- Different types of résumé for Different posts

(v) Group Discussion

- Difference between Group discussion and debate
- Importance of Group Discussion
- Group Decision
- Ensuring success in group discussions

(vi) Telephone & E-mail Etiquette

- Telephone etiquette
- E-mail etiquette

(vii) Public Speaking

- Introductory speech
- Informative speech
- Persuasive speech
- Extemporesession

MODULE 4: Time Management
- Importance of time management
- Values & beliefs
- Goals and benchmarks – The ladders of success
- Managing projects and commitments
- Prioritizing your To-do's
- Getting the results you need

MODULE 5: Stress & Conflict Management
- Introduction to stress
- Types of stressors
- Small changes and large rewards
- Stress prevention
- Overcoming unhealthy worry
- Stress at home and workplace
- Dealing with frustration and anger
- Stress reducing exercises
- Understanding conflicts
- Violent and Non-violent conflicts
- Source of conflict
- Structural and cultural violence

MODULE 6: Physical Fitness and Personal Grooming
- Fitness and exercise
- Balanced & healthy diet
- Skin care & Hair care
- Make-up skills

MODULE 7: Appropriateness of Apparel
- Apparel & Personality
- Psycho-social aspects of apparel
- Style-tips for smart dressing & effective use of design elements

MODULE 8: Social Etiquette
- Civic Sense
- Workplace skills
- Meeting and greeting people
- Table Setting and table manners

MODULE 9: Decision Making Process and Problem Solving Skills

- Anatomy of a decision
- How to use problem solving steps and problem solving tools
- How to distinguish root causes from symptoms to identify right solution for right problems
- How to improve problem solving and decision making by identifying individual problem solving styles
- The creative process for making decisions
- Tools to improve creativity
- Implementing the decision – Wrap up

(i) Leadership Skills

- Handling peer pressure and bullies
- Team work
- Decision making
- Taking initiatives

(ii) Goal Setting

- Wish list
- SMART goals
- Blueprint for success
- Short-term, Long-term, Life-term Goals

(iii) Motivation

- Factors of motivation
- Self talk
- Intrinsic & extrinsic motivators

Books Recommended

1. Rossi, P.(2011).*Everyday Etiquette: How to navigate 101 common and uncommon social situations*. St Martins Pr.
2. Pietrzak, T.,& Fraum,M. (2005). *Building career success skills*. ASTD Press.
3. Treffinger, D.J., Isaksen, S.G., &Brian, K. (2005). *Creative problem solving: An Introduction*.
4. Carr, A. (2004).*Positive Psychology: The science of happiness and human strengths*. Burnner-Routlrdge.
5. Oberg, B.C. (1994).*Speech craft: An Introduction to public speaking*. Meriwether Publishing.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics) (FYIP)

Semester-IV

Session- 2024-25

Master of Science (Mathematics) (FYIP) Semester-IV										
Course Code	Course Type	Course Title	Hours Per Week L-T-P	Credits L-T-P	Total Credit	Marks				Examination time in hours
						Total	Th	P	CA	
FMAL-4331	C	Vector calculus	3-1-0	3-1-0	4	100	80	-	20	3
FMAL-4332	C	Partial Differential Equations	3-1-0	3-1-0	4	100	80	-	20	3
FMAL-4333	C	Group Theory	3-1-0	3-1-0	4	100	80	-	20	3
FMAM-4334	C	Statistical Method	3-0-2	3-0-1	4	100	50	30	20	3+3
FMAM-4135	C	Foundation of Statistical Computing	3-0-2	3-0-1	4	100	50	30	20	3+3
SECS-4522	AC	*Social Outreach	*0-0-2*	0-0-1	1	25	-	20	5	-
Total					20	500				

Note:

*Marks of these papers will not be added in total marks and only grades will be provided.

C- Compulsory

AC- Audit Course

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Vector Calculus
Course Code: FMAL-4331
Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the physical concept of vectors and perform basic calculus on vector-valued functions.

CO 2: Solve physical problems based on calculus using vector-valued functions and calculate the tangent vector and normal vector at a point on a space curve described by a vector-valued position function.

CO 3: Find the values of gradient, divergence and curl operator of given vectors in orthogonal system and understand the concept of line integral.

CO 4: Find the application of Gauss theorem and Stokes's theorem in real life problems.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Vector Calculus
Course Code: FMAL-4331

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80
3 1 0 | CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Scalar and vector product of three vectors, Product of four vectors, Reciprocal vectors, Vector differentiation, Scalar valued point functions, Vector valued point functions, Directional derivatives and the Gradient, Tangent plane and normal to a given surface.

Unit II

Gradient of a scalar point function, Divergence and Curl of a vector point function, Divergence and Curl of sums and products and their related vector identities, Laplacian operator.

Unit III

Orthogonal Curvilinear Coordinates, Conditions for orthogonality, Gradient, Divergence and Curl in terms of orthogonal curvilinear coordinates, Line integrals: Scalar and vector line integrals, line integrals along curves, Work done, Conservative vector fields, Green's theorem in plane.

Unit IV

Surface integral, Volume integral, Gauss Divergence Theorem, Stokes theorem and the problems based on these theorems.

Reference Books:

1. D. E. Bourne and P. C. Kendall, Vector analysis and Cartesian tensors, CRC Press, Taylor and Francis Group, London, Third edition, 1992 (Scope as in Chapters: 2-6)
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 42nd edition, 2012 (Scope as in Chapters: 3 (3.8-3.10) and 8)

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Partial Differential Equations
Course Code: FMAL- 4332
Course Outcomes

After passing this course, the students will be able to:

CO 1: Formulate partial differential equations &Apply Lagrange's Method to find solutions of partial differential equations and understand basic properties of standard partial differential equations.

CO 2: Perform various methods to solve homogeneous partial differential equations and apply Charpit method in solving problems.

CO 3: Use computational tools to solve Non homogeneous linear P.D.E. with constant coefficients, reducible and irreducible linear P.D.E. with constant coefficients, method of finding the complementary function and particular integral.

CO 4: Classify and transform partial differential equations into canonical form.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Partial Differential Equations
Course Code: FMAL- 4332

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 80

3 1 0 | CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Partial Differential Equations of First Order: origin of first order partial differential equations. Formation of partial differential equations, Cauchy problem of first order equations, Linear P.D.E. of first order, Lagrange's Method

Unit-II

Integral surface through a given curve, Surface orthogonal to given system of surfaces, Non linearP.D.E of first order, Charpit's method, Homogeneous linear P.D.E. with constant coefficients, method of finding the complementary function and particular integral.

Unit-III

Non homogeneous linear P.D.E. with constant coefficients, reducible and irreducible linear P.D.E. with constant coefficients, method of finding the complementary function and particular integral.

Unit-IV

Partial differential equations of the second order. Origin of 2nd order equations. Linear P.D.E. with constant coefficients and their complete solutions.Second order equation with variable coefficient and their classification and reduction to standard form.

Text Book:

M D Rai Singhania, Ordinary and Partial Differential Equations, S Chand Publishing, New Delhi, 11th Edition, 2009

Reference Books:

1. H.T.H. Piaggio: Differential equations, CBS Publishers

2. IAN N.Sneddon, Elements of partial differential equations, Dover Publisher, 2006

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Group Theory
Course Code: FMAL - 4333
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Understand the concept of integers, divisors, division algorithm and equivalence relation and its classes.

CO 2: Demonstrate understanding of algebraic structures and its properties with regard to working with various number system. Understand the concept of groups, subgroups, centralizer, normalizer and various properties of groups.

CO 3: Explain the notion of cosets, normal subgroup, quotient group, cyclic group, generator of cyclic group.

CO 4: Describe all permutation concepts, order, permutation as a product of two cycles, even odd permutations, alternating group.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Group Theory
Course Code: FMAL - 4333

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80
31 0 | CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Properties of Integers: Well ordering Principle, Division algorithm, Greatest common divisor, G.C.D. as a linear combination, Euclidean algorithm, Euclid's Lemma, Least common multiple, Fundamental Theorem of arithmetic, Integers modulo n, Binary relations, Equivalence relations, Equivalence classes partition.

Unit-II

Definition & examples of groups, Elementary properties of groups, Uniqueness of the identity element, Cancellation, Uniqueness of inverses, Subgroups, Examples of subgroups, Tests for a set to be a subgroup, Centralizer, Normalizer, Centre of a group.

Unit-III

Product of two subgroups, Properties of cosets, Lagrange's theorem, Normal subgroups, Factor groups, Cyclic groups, Properties of cyclic groups, Generators of cyclic groups, Fundamental theorem of cyclic groups.

Unit-IV

Permutation groups, Cyclic notation for permutations, Permutation as product of disjoint cycles, Order of a permutation, Commutativity of product of disjoint cycles, Permutation as a product of 2-cycles, Even and odd permutations, Alternating group.

Reference Books:

1. D. Burton, Elementary Number Theory, McGraw-Hill Education, New York, Seventh Edition, 2011 (Scope as in Chapters: 2, 3, 8).
2. J. A. Gallian, Contemporary Abstract Algebra, CRC Press, Taylor & Francis Group, New York, Ninth Edition, 2015 (Scope as in Chapters: 1-5, 7, 9).

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Statistical Methods
Course Code: FMAM-4334
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Understand the concept of correlation, and apply its techniques to identify correlation between given set of data and regression curves depicting relation among the physical quantities.

CO 2: Understand all the concepts related to sampling distribution.

CO 3: Demonstrate understanding the logic and framework of the inference of hypothesis testing as making an argument.

CO 4: Interpret the results of the hypothesis test.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Statistical Methods

Course Code: FMAM-4334

Examination Time: (3+3) Hours | Max. Marks: 100

Theory: 50

L-T-P: 3-0-1 | Practical: 30

CA: 20

Instructions for the Paper Setters:
Eight questions of equal marks (10 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

Bivariate data, Karl–Pearson's correlation coefficient and its Properties, Spearman's rank correlation coefficient, fitting of straight line, regression analysis.

Unit-II

Sampling Distributions: Chi-square, t and F-distributions with their mean and variance. Relation between Chi-square, t and F-distributions.

Unit-III

Large Sample test (Z Test): Test of single mean and difference of means, test for single proportion and difference of proportions, t test for single mean and equality of means.

Unit –IV

Chi-square test - as goodness of fit and association of attributes, F-test as test of equality of population of variance.

Note:
Practical: Based on syllabus of Statistical Methods for inferential Statistics.

Text Book:

S.C Gupta, V.K. Kapoor, Fundamental of Mathematical Statistics, Sultan Chand & Sons, New Delhi, eleventh edition, 2019.

Reference Book:

R. V. Hogg, Joseph W. Mackean, and C. Allen, Introduction to Mathematical Statistics, Pearson Education, Sixth edition, 2009.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Foundation of Statistical Computing

Course Code: FMAM-4135

Course Outcomes:

After passing this course the student will be able to:

CO1: Comprehend basics of Statistical Computing and managing data structures like vector, matrix, etc.

CO2: Create, operate and manage lists and data frames.

CO3: Apply control and I/O statements for generating outputs.

CO4: Simulate various descriptive and analytical algorithms using R language along with their visualization.

Master of Science (Mathematics) (FYIP)

Semester–IV

Session: 2024-25

Course Title: Foundation of Statistical Computing

Course Code: FMAM-4135

Examination Time: (3+3) Hours | Max. Marks: 100

Theory: 50

L-T-P: 3-0-1 | Practical: 30

Credit: 4 | CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (10 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT - I

Data Statistics: Sampling, Cumulative statistics, Statistics for Data frames, matrix objects and lists.

Introduction to R, 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

UNIT - II

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 , string operations

UNIT - III

Input/ Ouput: scan() , readline() Function, Printing to the Screen Reading and writing CSV and text file. Control statements: Loops, Looping Over Nonvector, Sets, if-else , writing user defined function, scope of the variable, R script file

UNIT - IV

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.

Note:

Practical: Based on simple mathematical problems and based on syllabus of Statistical Methods for descriptive Statistics.

References / Textbooks:

1. Andrie de Vries and Joris Meys, R Programming for Dummies, Wiley (2016), 2nd Edition.
2. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (2017), 1st Edition.
3. Sandip Rakhsit, Statistics with R Programming, McGraw Hill Education (2018), 1st Edition.
4. Garrett Grolemund, Hands on Programming with R, O'Reilly (2014), 1st Edition
5. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley (2013)
6. Tilman M. Davies, The Book of R: A first Course in Programming and Statistics, No Strach Press (2016), 1st Edition

FACULTY OF SCIENCES

SYLLABUS

of

Bachelor of Science (Honours)
Mathematics (Semester: V -VI)

(Under Continuous Evaluation System)

Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR

(Autonomous)

Bachelor of Science (Honours) Mathematics
Session: 2024-25

Programme Specific Outcomes

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

PSO1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theorem of Mathematics and their applications in the real world to an advanced level, enhance career prospects in a huge array of field suitable to succeed at an entry level position in Mathematics post graduate program.

PSO2: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics, Chemistry, Electronics, Computer Science and Economics.

PSO3: Create and develop Mathematical software application using a systematic approach & apply discrete Mathematical concept to practical application.

PSO4: Demonstrate knowledge of Calculus I & II, Matrices and Theory of Equations, Analytical and Solid Geometry, Statics & Tensor Calculus and able to apply this knowledge to analyze a variety of Mathematical Phenomena.

PSO5: Demonstrate knowledge of physical chemistry & apply this knowledge to analyze a variety of chemical phenomena & will be able to interpret and analyze quantitative data.

PSO6: Understand and demonstrate the knowledge of Mechanics, area, volume and displacement with differential equation of the orbit.

PSO7: Understand the basic concepts and basic principles of Demand and Supply, Measurement of Price Elasticity of Demand and apply Economic theories to derive cost function from Production Function.

PSO8: Learn implications of Revenue curves and their mutual relationships.

PSO9: Develop statistical approach and mathematical thinking among students to problem solving on a diverse variety of disciplines.

PSO10: Have knowledge of computer fundamentals, able to handle practical programming problems using C and analyze large volume of data using various statistical techniques

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Science (Honours) Mathematics Semester-V
Session: 2024-25

Bachelor of Science (Honours) Mathematics Semester-V							
Course Code	Course Type	Course Title	Max. Marks				Examination time in hours
			Total	Ext.		CA	
				L	P		
BOML-5331	C	Number Theory	100	80	-	20	3
BOML-5332	C	Discrete Mathematics	100	80	-	20	3
BOML-5333	C	Linear Integral Equations	100	80	-	20	3
BOML-5334	C	Riemann Integration	100	80	-	20	3
BOML-5335	C	Metric Spaces	100	80	-	20	3
SECJ-5551	AC	*Job Readiness Course	25	20	-	5	
Total Marks			500				

Note:
*Marks of these papers will not be added in total marks and only grades will be provided.
C -Compulsory
AC-Audit Course

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Number Theory
Course Code: BOML-5331

Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Find solutions of specified linear Diophantine equation and system of linear congruences.

CO 2: Apply Fermat's to prove relation involving prime numbers.

CO 3: Apply the Wilson's and Euler's theorem to solve numerical problems and explore properties of phi function in real world problems.

CO 4: Understand application of important arithmetic functions.

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Number Theory
Course Code: BOML-5331

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
CA: 20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

The Diophantine equation ax + by = c and its solution, Basic properties of congruences, Complete and Reduced set of residues modulo n, Special divisibility tests.

Unit-II

Polynomial conguences, Langrange's theorem, Linear congruences, Chinese remainder theorem, The Fermat's theorem, Pseudo prime, Absolutely Pseudo prime.

Unit-III

Wilson's theorem. Euler's Phi function, Euler's theorem, some properties of the Phi Function, Gauss theorem.

Unit-IV

Number-Theoretic functions: The Sum and Number of divisors, The Mobius Inversion formula, The Greatest integer function for treating divisibility problems.

Text Book:

D. Burton, Elementary Number Theory, McGraw-Hill Education, Boston, Seventh edition, 2012 (Scope as in Chapters 2, 4-7).

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Discrete Mathematics
Course Code: BOML-5332
Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Understand Boolean algebra , K-Map and application of Boolean Algebra to switching circuits.

CO 2: Understand the use of Graphs and Models.

CO 3: Understand the language of trees with various types of trees and methods of traversing trees.

CO 4: Have substantial experience to comprehend formal logical and write an argument using logical notation and determine if the argument is valid or not.

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Discrete Mathematics
Course Code: BOML-5332

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit- I

Boolean Algebra – Boolean Algebra, Unary Operation, Binary Operation, Laws of Boolean Algebra, Principle of Duality, Boolean Function, Fundamental Product, Sum of Product form, Complete sum of Product form, Minterm, Disjunctive Normal form, Conjunctive Normal form, obtaining a Disjunctive Normal form, obtaining a Conjunctive Normal form, Karnaugh Map upto four variables, Applications of Boolean Algebra to Switching Circuits.

Unit- II

Graph, Subgraph, Paths, Directed and Undirected graphs, Connected graphs, Weakly connected graphs, Regular and bipartite graphs, Weighted graphs, Euler path and graphs, Hamiltonian path and graphs, planar graphs.

Unit- III

Chromatic number in graphs, shortest path in weighted graphs. Tree, directed tree, ordered tree, Binary tree, traversing binary tree, spanning tree, minimum spanning tree, Kruskal's algorithm to find minimum spanning tree.

Unit- IV

Propositional Calculus – Basic Logic Operations, Statement, Proposition, Propositional Variables, Truth Table, Combination of Propositions, Laws of the Algebra of Proposition, Variations in Conditional Statement, Principle of Duality, Logical Implication, Logical Equivalence of Proposition, Tautologies, Contradiction, Contingency, Argument, Proof of Validity, Quantifiers, Existential Quantifier, Universal Quantifier, Negation of Quantified Propositions, Propositions with Multiple Quantifier.

Text Book:

S. B. Gupta and C. P. Gandhi, Discrete Structures, University Science Press, Second edition, 2010 (Scope as in Chapters: 10, 11, 12, 13).

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Linear Integral Equations
Course Code: BOML-5333
Course Outcomes

On satisfying the requirements of this course, students will have the Knowledge of:

CO 1: Concept of Linear Integral equations and various kinds of Kernels, Volterra and Fredholm Integral equations of first and Second kind, reduction of initial value problem to a Volterra Integral equation and solution of Volterra Integral equation using method of Resolvent Kernel.

CO 2: Reduction of Boundary Value Problem to Fredholm Integral Equation and techniques to solve homogeneous and non-homogeneous Fredholm Integral equations.

CO 3: Laplace Transform and its basic properties and how to find solution of Volterra Integral Equations using Laplace Transform.

CO 4: Construction of Green's function and application of Green's function in finding the solution of Boundary Value Problem.

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024 -25
Course Title: Linear Integral Equations
Course Code: BOML-5333

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Linear integral equations of the first and second kind of Fredholm and Volterra type, some basic identities, Types of kernels: Symmetric kernel, Separable kernel, Iterated kernel, resolvent kernel, Initial value problems reduced to Volterra integral equations, Solution of Volterra integral equation using: Resolvent kernel, Successive approximation.

Unit-II

Boundary value problems reduced to Fredholm integral equations, Solution of Fredholm integral equations using separable kernel, resolvent kernel. Methods of successive approximation to solve Fredholm equations of second kind. Solution of Homogeneous Fredholm integral equation: Eigen values, eigen vectors.

Unit-III

Integral transforms for solving integral equations: Basic properties of Laplace transforms, Solution of Abel's equation using Laplace transform, Application of Laplace transform to the Solution of Volterra integral equations with convolution type kernels.

Unit-IV

Green's function, Basic four properties of the Green's function, Procedure for construction of the Green's function by using its basic four properties, Construction of Green's function for boundary value problems, Solution of boundary value problems using Green's function, reducing boundary value problems to an integral equation using Green's function.

Text Book:

M.D. Raisinghania, Integral Equations & Boundary Value Problems, S. Chand Co. Pvt. Ltd., New Delhi, First Edition, 2007 (Scope as in Chapters 1-6, 9, 11).

Bachelor of Science (Honours) Mathematics

Semester–V

Session: 2024-25

Course Title: Riemann Integration

Course Code: BOML-5334

Course outcomes

After passing this course, the students will be able to:

CO 1: To understand the concepts of Riemann sum, partitions, Upper and lower Riemann integrals, Refinement of partitions, Darboux's Theorem and Necessary and sufficient conditions for Integrability.

CO 2: To know and describe the Particular classes of Integrable functions, Properties of Integrable functions, Integrability of the sum, difference, product, quotient and modulus, First and second mean value theorems of integral calculus.

CO 3: Explain the concept of Improper Integrals and conditions for existence, Comparison test for convergence of improper integrals, Abel's Test and Dirichlet test for convergence.

CO 4: To distinguish between the absolute convergence and conditional convergence and find the relation between Beta and Gamma functions & their converging behaviour

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024-25
Course Title: Riemann Integration
Course Code: BOML-5334

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Definition and Existence of the Riemann Integral, Partitions and Riemann (or Darboux) sums, Some properties of Darboux Sums, Upper and lower Riemann integrals, Refinement of partitions, Darboux's Theorem, Necessary and sufficient conditions for integrability.

Unit-II

Particular classes of Integrable functions, Properties of integrable functions, Integrability of the sum, difference, product, quotient and modulus, The Fundamental theorem of integral calculus, First and Second mean value theorems of integral calculus.

Unit-III

Improper Integrals and conditions for existence, Comparison test for convergence of improper integrals, Abel's Test and Dirichlet test for convergence.

Unit-IV

Absolute convergence and conditional convergence of improper integrals, Beta and Gamma functions, Properties of Beta functions, Recurrence formulae for Gamma function, Relation between Beta and Gamma functions.

Text Book:

S. Narayan and M. D. Rai Singhania, Elements of Real Analysis, S. Chand & Co. Pvt. Ltd., New Delhi, Seventeenth Edition, 2016 (Scope as in chapters: 13, 16, 20).

Reference Books:

1. A. Kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, Taylor & Francis Group, New York, First Edition, 2014 (Scope as in chapters: 6).

2. S. C. Malik and S. Arora, Mathematics Analysis, New Age International Publishers, New Delhi, Second Edition, 2005 (Scope as in chapters: 9,11).

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024-25
Course Title: Metric Spaces
Course Code: BOML-5335
Course outcomes

After passing this course, the students will be able to:

CO1: Explain the fundamental concepts of Metric Spaces and their role in modern mathematics.

CO2: Understand the concept of compact sets , separated sets and state and prove Heine – Borel theorem

CO3: Demonstrate sequence in a metric space and give argument related to convergence.

CO4: Give argument related to continuity, completeness, compactness, connectedness in metric spaces.

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2024-25
Course Title: Metric Spaces
Course Code: BOML-5335

Examination Time: 3 Hours Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Metric on a set, Metric space, definitions and examples, open sets, interior and closure of a set, closed set, dense and nowhere dense sets, exterior, frontier and boundary points and their properties.

Unit-II

Compact subsets of a metric space, elementary properties of compact sets, Heine-Borel theorem, separated sets, connected subsets of a metric space.

Unit-III

Sequences in a metric space, Convergent Sequences, Cauchy Sequences, Complete Metric Spaces, Cantor's Intersection Theorem, Baire's Category Theorem.

Unit-IV

Continuous Functions in a metric space, continuity and compactness, continuity and connectedness, discontinuities, monotonic functions, uniform continuity

Text Book:

S. Narayan and M. D.Raisinghania, Elements of Real Analysis, S. Chand& Company, New Delhi, 12th Edition, 2011 (Scope as in Chapter- 19)

Reference Books:

1.S. C.Malik and S. Arora, Mathematics Analysis, New Age International Publishers, New Delhi, 5th Edition, 2021 (Scope as in Chapter- 19)

2.W. Rudin, Principles of Mathematical Analysis, McGraw-Hill Education, New York, 3rd Edition, 1976 (Scope as in Chapters- 2, 3(3.1-3.12), 4)

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Three Year Degree Programme

Bachelor of Science (Honours) Mathematics Semester-VI

Session: 2024-25

Bachelor of Science (Honours) Mathematics Semester-VI							
Course Code	Course Type	Course Title	Max. Marks				Examination time in hours
			Total	Ext.		CA	
				L	P		
BOML-6331	C	Complex Analysis	100	80	-	20	3
BOML-6332	C	Analytical Skills	100	80	-	20	3
BOML-6333	C	Numerical Analysis	100	80	-	20	3
BOML-6334	C	Special Functions	100	80	-	20	3
BOML-6335	C	Differential Geometry	100	80	-	20	3
Total Marks			500				

Note:

C -Compulsory

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024-25
Course Title: Complex Analysis
Course Code: BOML-6331
Course outcomes

After passing this course, the students will be able to:

CO1: Justify the need for a complex number system and explain how it is related to other existing number system. Define a function of complex variable, limit, continuity and differentiability, Analytic functions, Conjugate function, Cauchy Riemann equations, Harmonic function and carry out basic mathematical operations with complex numbers.

CO2: State and prove Cauchy's theorem, Cauchy's integral formula, Cauchy's inequality, Poisson's integral formula, Morera's theorem and Liouville's theorem.

CO3: Define singularities of a function, know the different types of singularities and be able to determine the Residue at singularities of a function.

CO4: Learn The Fundamental Theorem of Algebra, The Argument principle, Rouche's theorem, Conformal transformations, Bilinear transformations, Critical points, Fixed points, and Problems on cross ratio and bilinear transformation.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024-25
Course Title: Complex Analysis
Course Code: BOML-6331

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Functions of complex variables, Topology of real line and complex plane, limit, continuity and differentiability, Analytic functions, Conjugate function, Cauchy Riemann equations (Cartesian form), Harmonic function, 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.

Unit-III

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

Unit-IV

The Fundamental Theorem of Algebra, The Argument principle, Rouche's theorem, Conformal transformations, Bilinear transformations, Critical points, Fixed points, The cross ratio, Problems on cross ratio and bilinear transformation.

Text Book:

S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, New Delhi, Second Edition, 1995 (Scope as in Chapters: 1-5).

Reference Books:

1. S. Narayan, Theory of Functions of a Complex Variable, S. Chand Co. Pvt. Ltd., New Delhi, Fourth Edition, 2009 (Scope as in Chapters: 3, 5, 7, 9, 11).

2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, McGraw-Hill Education, New York, Eighth Edition, 2004 (Scope as in Chapters: 1, 2, 4, 5, 6, 7, 9).

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024-25
Course Title: Analytical Skills
Course Code: BOML-6332
Course outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of sequence and series, clock problems, blood relationship.

CO 2: Demonstrate procedural fluency with real number arithmetic operations and use these operations to represent real world scenarios and to solve stated problems and demonstrate number sense and conversion between fractions, decimals and percentages.

CO 3: Use simple and compound interest to do business calculations such as value of money, maturity value, present value, future value and able to differentiate which math method should be used for different problems and understand the concept of mensuration.

CO 4: Analyse data being presented in the form of tables, Venn diagrams, pie charts.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024-25
Course Title: Analytical Skills
Course Code: BOML- 6332

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Sequence and Series: Analogies of Numbers and Alphabets, Completion of blank spaces following the pattern in A: b::C: d relationship, Odd thing out, Missing number in a sequence or a series.
Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

Unit -II

Arithmetic Ability: Algebraic operations BODMAS, Fractions, Decimals Fractions, Divisibility rules, LCM & GCD (HCF), Elementary Algebra.
Quantitative Aptitude: Averages, Ratio and proportion, Problems on ages, Time and Work, Work and Wages, Pipes and Cisterns, Time and Distance, Trains, Streams.

Unit -III

Mensuration: Measurement of Areas, Surface Areas and Volume.
Business Computations: Percentages, Profit & Loss, Partnership, Simple and Compound Interest.

Unit-IV

Data Analysis: The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a Passage is to be analysed and the questions pertaining to the data are to be answered.

Reference Books:

1. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Co. Pvt. Ltd., New Delhi, Eighth Edition, 2017 (Scope as in Chapters:1-4, 6, 8, 11-14, 16-20, 22-23, 27-28, 35 (Section I) and Chapters 36-39 (Section II)).
2. R.V. Praveen, Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd., Delhi, Third Edition, 2016 (Scope as in Chapters: 1, 4-8, 13-21, 23-29, 32, 34, 36, 39 (Part I) and Chapters 1,3,5 (Part II)).

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024 -25
Course Title: Numerical Analysis
Course Code: BOML-6333
Course Outcomes

After passing this course, the students will be able to:

CO 1. Know how to find the roots of transcendental equations.

CO 2. Perform computation for solving a system of equations and understand its application in all branches of engineering.

CO 3. Learn how to interpolate the given set of values and understand the curve fitting for various polynomials. They will be able to compute numerical integration and differentiation, numerical solution of ordinary differential equations.

CO 4. Learn numerical solution of differential equations.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024 -25
Course Title: Numerical Analysis
Course Code: BOML-6333

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setter:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

The students can use only Non-Programmable& Non-Storage Type Calculator.

Unit-I

Error generation, error propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Method of false position, Newton-Raphson method, Generalized Newton-Raphson method, Iteration method, Muller's method, Rate of convergence of these methods.

Unit-II

Solution of linear system of equation: Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative methods: Jacobi's method, Gauss Seidel method. Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator. Interpolation with divided difference, Newton's formula, Lagrangian method.

Unit-III

Finite difference interpolation, Gauss formula, Stirling formula, Bessel's formula, Error Estimation, Extrapolation. Numerical differentiation: Method based on interpolation. Numerical Integration: Trapezoidal rule, Simpson's rule, Weddle rule, Romberg integration, Gaussian integration method, Gaussian legendre integration. Double numerical integration.

Unit-IV

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.

Text Book:

M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, Delhi, Fifth edition, 2007 (Scope as in Chapters 2-6).

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024 -25
Course Title: Special Functions
Course Code: BOML-6334
Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of Hyper geometric function, its integral form and Contiguity of Hyper geometric functions and solution of hyper geometric equation as a function of its parameters.

CO 2: Understand the concept of Bessel's Function and their properties like Recurrence Relations, Generating Function etc., modified Bessel Function and to recognize some of the Partial Differential Equations that can be solved by application of Bessel Functions.

CO 3: Understand the concept of Legendre's Function and their properties like Orthogonal Property, Recurrence Relations, Rodrigue's formula and Generating Function etc. and understand Hyper geometric forms of Legendre's function.

CO 4: Understand the concept of Hermite Polynomials, basic properties like Orthogonality, Rodrigue's formula etc. and its relation with $2^{F}{}_{0}$.

Bachelor of Science (Honours) Mathematics

Semester–VI
Session: 2024 -25
Course Title: Special Functions
Course Code: BOML-6334

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Hypergeometric functions, The function $F(a,b,c,z)$, Integral form, Evaluation of $F(a,b,c,1)$, The contiguous function relations, The Hypergeometric differential equation, solution of hypergeometric equation, $F(a,b,c,z)$ as a function of its parameters, Relation between z and 1-z, A quadratic transformation, A theorem due to Kummer.

Unit -II

Bessel's functions of first and second kind, Bessel's differential equation, Recurrence relations, Generating functions, Bessel's integral, Modified Bessel functions, Neumann polynomials, Neumann series.

Unit –III

Legendre's function $P_n(x)$, A generating function, Recurrence relation, Legendre differential equation, The Rodrigues formula, Bateman's generating function, Hypergeometric forms of $P_n(x)$ Laplace's first integral form, Orthogonality.

Unit -IV

Hermite Polynomials, Recurrence relations, Rodrigues formula, Integrals, The Hermite polynomial as $2F_0$, Orthogonality.

Text Book:

S. S Trivedi, Special functions, Pragati Prakashan, Meerut, XXI edition, 2021 (Scope as in chapters 3,4,5,6,7)

Reference Book:

M.D. Raisinghania, Ordinary and Partial Differential equations, S. Chand publication, New Delhi , 18th edition, 2013 (Scope as in chapters 9,10,11,12,14)

Bachelor of Science (Honours) Mathematics
Semester–VI
Session 2024 -25
Course Title: Differential Geometry
Course Code: BOML-6335
Course Outcomes

After passing this course, the students will be able to:

CO 1: Able to explain the concept of theory of space curve tangent, normal, binormal and rectifying plane.

CO 2: Able to understand contact between curves and surfaces, locus of centre of curvature, spherical curvature as well as calculate the curvature and torsion of curve

CO 3: Understand the concept of Spherical indicatrix, envelopes, and two fundamental forms,

CO 4: Understand tensor variables, metric tensor, contra-variant, covariant and mixed tensors & and able to apply tensors among mathematical tools for invariance and the reason why the tensor analysis is used and explain usefulness of the tensor analysis.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2024 -25
Course Title: Differential Geometry
Course Code: BOML-6335

Examination Time: 3 Hours | Max. Marks: 100
Theory:80
CA:20

Instructions for the Paper Setters:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

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

Unit-II

Curvature and torsion, Serret-Fremet Formulae, Helics, Evolute and Involute of a parametric curve, Osculating circle and osculating sphere, spherical curves.

Unit –III

Surfaces in R^3: Implicit and Explicit forms of the equation of surface, two fundamental forms of a surface, Family of surfaces, Edge of regression, Envelops .

Unit -IV

Einstein's summation convention, Transformations of coordinates, Tensor's law for transformation, contravariant, covariant and mixed Tensors, addition, outer product, contraction, inner product and quotient law of tensors, metric Tensor and Riemannian metric.

Text Book:

1. G.S Malik, Differential Geometry, Pragati Prakashan, Meerut , IX edition , 2013 (Scope as in chapters 1-10)

Reference Books:

1. D Somasundaram, Differential Geometry: A first Course, Alpha Science International Limited, New Delhi, 2005 (Scope as in chapters 1,2)

2. C.E Weather burn, Differential Geometry, Cambridge University Press, Cambridge (Scope as in chapters 1,2,3,4)

FACULTY OF SCIENCES

SYLLABUS
of
Master of Science (Mathematics)
(Semester: I -II)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2024-26

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

Master of Science (Mathematics)

Session: 2024-26

Programme Outcomes

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

PO 1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theories of Mathematics and their applications in the real world to enhance career prospects in a huge array of field.

PO 2: Have knowledge of advanced models and methods of mathematics, including same from the research frontiers of the field and expert knowledge of a well-defined field of study, based on the international level of research in Maths.

PO 3: To generate skills in independently comprehending, analysing, modelling and solving problems at a high level of abstracts based on logical & structured reasoning.

PO 4: Use computer calculations as a tool to carry out scientific investigation and develop new variants.

PO 5: Use mathematical and statistical techniques to solve well defined problems and present their mathematical work, both in oral and written format.

PO 6: Propose new mathematical linear programming techniques & suggest possible software packages or computer programming to find solution to their questions.

PO 7: Apply the knowledge in modern industry or teaching or secure acceptance in high quality graduate program in maths and other fields such as the field of quantitative/mathematical finance, mathematical computing, statistics and actuarial sciences.

PO 8: Read, understand construct correct mathematical and use the library and electronic data basis to locate information on mathematical problem.

Master of Science (Mathematics)

Session -2024-26

Program Specific outcomes

After the successful completion of this course, the students will be able to

PSO 1: Develop a deeper and more rigorous understanding of calculus including defining terms and proving theorems about sets, functions, sequences, series, limits, continuity, derivatives, the Riemann integrals, and sequence of functions. The course will develop specialized techniques in problem solving.

PSO 2: Handle mathematical operations, analysis and problems involving complex numbers. Justify the need for a complex number system and explain how it is related to other existing number systems.

PSO 3: Understand the importance of algebraic properties with regard to working within various number systems, demonstrate ability to form and evaluate conjectures.

PSO 4: Apply differential equations to significant applied and/or theoretical problems, to model physical and biological phenomenon by differential equations and dynamical systems.

PSO 5: To describe fundamental properties including convergence, measure, differentiation and integration of the real numbers developing the theory underpinning real analysis, to appreciate how ideas and abstract methods in mathematical analysis can be applied to important practical problems.

PSO 6: To use tensor to describe measured quantities, to formulate and solve physics problems in areas such as stress, elasticity including problems in geometry, to analyze shapes in computer version and other areas of mathematical sciences.

PSO 7: To demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from field extension and Galois theory, to apply problem solving to diverse situations in physics, engineering and other mathematical contexts.

PSO 8: To understand forces linear and circular and their effects on motion, to analyze how a physical system might develop or alter over time and to study the cause of these changes.

PSO 9: To understand the concept of Relation and Function, Generation Function and Recurrence, Truth tables and its various uses in mathematics, Quantifiers, Semi Groups and Monoids, Congruence Relations

KANYA MAHA VIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF TWO YEAR DEGREE PROGRAMME
(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics)

(Session 2024-2026)

Semester-I										
Course Code	Course Title	Course Type	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Th	P	CA	
MMSL-1331	Real Analysis	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-1332	Complex Analysis	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-1333	Algebra-I	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-1334	Mechanics-I	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-1335	Differential Equations	C	6-0-0	6-0-0	6	100	80	-	20	3
TOTAL					30					

C-Compulsory Course

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Real Analysis
Course Code: MMSL-1331
Course outcomes

After the completion of this course, students should be able to

CO 1: Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts of interior points, interior and closure, open set, closed set, derived set, closure of a set and compact set.

CO 2: Give argument related to Separated sets, connected sets, components, Convergence and completeness in metric spaces.

CO 3: Understand and derive proofs of mathematical theorems related to limit and continuity, continuity and compactness, continuity and connectedness and uniform continuity.

CO 4: Differentiate between sequence and series of functions and able to solve problems related to uniform convergence and differentiation and use the polynomials to approximate a function.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Real Analysis
Course Code: MMSL-1331

Examination Time: 3 Hrs

LTP
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Set Theory: Finite, countable and uncountable sets. Metric spaces; open balls, closed balls, open and closed sets, Neighborhood, limit points, interior points, interior and closure, k- cells, compactness of k-cells, Compact subsets of Euclidean space R^k,Perfect sets, The Cantor set**.**

Unit-II

Separated sets, connected sets in a metric space, Connected subsets of real line, Components, Sequences in Metric Spaces: Convergent sequences (in Metric Spaces), subsequences, Cauchy sequences, Complete metric spaces, Cantor's Intersection Theorem.

Unit-III

Baire's theorem, Banach contraction principle, Continuity: Limits of functions (in metric spaces) Continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Monotonic functions, Uniform Continuity.

Unit-IV

Sequences and Series of functions: Discussion of main problem, Uniform Convergence, Uniform Convergence and Integration, Uniform Convergence and Differentiation, Equicontinuous families of functions, Arzela's Theorem, Weierstrass Approximation theorem.

Text Book:

1. Rudin, W., Principles of Mathematical Analysis (3^{rd}Edition), Mc Graw-Hill Ltd Ch.2,Ch.3, (3.1-3.12), Ch.4, Ch.6, (6.1-6.22), 2017.

Reference Books:

1. Simmons, G.F., Introduction to Topology and Modern Analysis, McGraw-Hill Ltd (App.1), pp 337-338, Ch.2 (9-13), 1963.
2. Narayan, S.,A course of Mathematical Analysis,S.ChandPublicationsLtd,2005.
3. Apostol, T.M., Mathematical Analysis 2^{nd} Edition7.18(Th.7.30&7.31), Narosa Publication, 2002.
4. Malik, S.C. and Arora, S., Mathematical Analysis, New Age International Publisher, 2017.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Complex Analysis
Course Code: MMSL-1332
Course Outcomes

CO1. Define a function of complex variable and carry out basic mathematical operations with complex numbers. State and prove the Cauchy Riemann Equation and use it to show that a function is analytic.

CO2.Understand the principle of analytic Continuation and concerned results, critical points and fixed points.

CO3.To understand the modulus of complex values functions and result regarding that and to develop manipulation skills in the use of Rouche's theorem,

CO4. Define singularities of a function, know the different types of singularities and be able to determine the points of singularities of a function.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Complex Analysis
Course Code: MMSL-1332

Examination Time: 3 Hrs

LTP
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Functions of complex variables, continuity and differentiability. Analytic functions, Conjugate function, Harmonic function. Cauchy Riemann equations (Cartesian and Polar form). Construction of analytic functions, Complex line integral, Cauchy's theorem, Cauchy's integral formula and its generalized form.

Unit-II

Cauchy's inequality. Poisson's integral formula, Morera's theorem. Liouville's theorem, Conformal transformations. Bilinear transformations. Critical points, fixed points, cross-ratio. Problems on cross-ratio and bilinear transformation, Analytic Continuation, Natural Boundary, Schwartz Reflection Principle.

Unit-III

Power Series, Taylor's theorem, Laurent's theorem. Maximum Modulus Principle. Schwarz's lemma. Theorem on poles and zeros of meromorphic functions. Argument principle. Fundamental theorem of Algebra and Rouche's theorem.

Unit-IV

Zeros, Singularities, Residue at a pole and at infinity. Cauchy's Residue theorem, Jordan's lemma.

Integration round Unit circle. Evaluation of integrals of the type $\int_{-\infty}^{\infty} f(x)dx$.

Text Book:

S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, New Delhi, Second Edition, 1995

Reference Books:

1. S. Narayan, Theory of Functions of a Complex Variable, S. Chand Co. Pvt. Ltd., New Delhi, Fourth Edition, 2009 (Scope as in Chapters: 3, 5, 7, 9, 11).

2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, McGraw-Hill Education, New York, Eighth Edition, 2004 (Scope as in Chapters: 1, 2, 4, 5, 6, 7, 9).

Master of Science (Mathematics)

Semester-I
Session: 2024-26
Course Title: Algebra-I
Course Code: MMSL-1333
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Understand the importance of the algebraic properties with regard to working with various number systems, explain the significance of the notion of a normal subgroup, quotient group, and cyclic group.

CO 2: Know and recognize the concepts of homomorphism, isomorphism and automorphism and understand permutation group.

CO 3: Describe the structure of finite abelian group using Sylow's theorems.

CO 4: State the definitions Direct Products: External and Internal, its applications; Semi direct Products, Recognition Theorems on semi direct products.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Algebra-I
Course Code: MMSL-1333

Examination Time: 3 Hrs

LTP
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Groups: Definition & examples, Subgroups, Normal subgroups and Quotient Groups, Lagrange's Theorem, Generating sets, Cyclic Groups.

Unit-II

The Commutator subgroups, Homomorphism, Isomorphism Theorems, Automorphisms, inner Automorphisms, Permutation groups, the alternating groups, Simplicity of A_n, $n \geq 5$, Cayley's theorem.

Unit-III

Structure of finite Abelian groups. Conjugate elements, class equation with applications, Cauchy's Theorem, Sylow's Theorems and their simple applications, Composition Series, and Jordan Holder Theorem, Solvable Groups.

Unit-IV

Direct Products: External and Internal. Fundamental theorem of finite Abelian groups and its applications; Semi direct Products, Recognition Theorems on semi direct products.

TextBook:

Fraleigh, J.B, An Introduction to Abstract Algebra, Pearson Education Publication Ltd., 2008.

ReferenceBooks:

1. Herstein,I.N.,TopicsinAlgebra,WilleyEastern PublicationLtd.,1975.
2. Singh,S.and Zameeruddin,Q.,ModernAlgebra,Vikas PublicationPvt.Ltd.,2006.
3. Artin,M.,Algebra,Pearson India,2015.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Mechanics-I
Course Code: MMSL-1334
Course Outcomes

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

CO 1: Determine velocity and acceleration of a particle along a curve; differentiate between radial and transverse components. Apply knowledge of angular velocity in circular motion to explain natural physical process and related technological advances.

CO 2: Understand and define the concept of Newton's law of motion and identify situations from daily life that they can explain with the help of these laws. Define Work, energy, power, conservative forces, impulsive forces, uniform resisted motion, and simple harmonic motion. Solve complex problems related to projectile motion under gravity, constrained particle motion and angular momentum of a particle. Define cycloid and its dynamical properties.

CO 3: Manage to solve problems related to reciprocal polar coordinates, pedal coordinates and equation, apply Kepler's law of planetary motion and Newton's law of gravitation in real life problems.

CO 4: Understand the concept of moment of inertia of a rigid body rotating about a fixed point, Momental ellipsoid and coplanar distribution.

Master of Science (Mathematics)

Semester-I
Session: 2024-26
Course Title: Mechanics-I
Course Code: MMSL-1334

Examination Time: 3 Hrs

LTP — Max. Marks: 100
6 0 0 — Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

Velocity and acceleration of a particle along a curve, Radial & Transverse components (plane motion). Relative velocity and acceleration. Kinematics of a rigid body rotating about a fixed point. Vector angular velocity, General motion of a rigid body, General rigid body motion as a screw motion. Composition of angular velocities. Moving axes. Instantaneous axis of rotation and instantaneous centre of rotation.

Unit-II

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 (iv) Damped and forced vibrations. Projectile motion under gravity, constrained particle motion, angular momentum of a particle. The cycloid and its dynamical properties.

Unit-III

Motion of a particle under a central force, Use of reciprocal polar coordinates, pedal co-ordinates and equations. Kepler's laws of planetary motion and Newton's Law of gravitation. Disturbed orbits, elliptic harmonic motion

Unit-IV

Moments and products of Inertia, Theorems of parallel and perpendicular axes, angular motion 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, Momental ellipsoid, equimomental systems, coplanar distribution.

Reference Books:

1. Chorlton, F,Text Book of Dynamics, CBS Publication ltd.,2002.
2. Loney, S.L.,An Elementary Treatise on the Dynamics of a Particle of rigid Bodies, Cambridge University Press, 2017.
3. Rutherford, D.E.:ClassicalMechanics, Oliver & Boydpublication,1951.
4. 2. D.E. Rutherford, Classical Mechanics, University Mathematical Texts, Oliver & Boyd Ltd., Edinburgh, 1964.

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Differential Equations
Course Code: MMSL-1335
Course Outcomes

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

CO 1: Formulate ordinary Differential Equation and also able to classify it as linear and non-linear. They will be able to find solution of a Total differential equations. Simultaneous differential equations, orthogonal trajectories and Sturm Liouville's boundary value problems.

CO 2: Understand the concept of Laplace Transformation with their properties and able to find solution of linear differential equations and simultaneous linear differential equations with constant coefficients with the help of Laplace Transformation.

CO 3: Demonstrate the concept of Fourier Transform: Definition, existence, and basic properties and its application to solve differential equations.

CO 4: Understand the concept of Special functions like Bessel functions, Hermite and Laguerre polynomials, Generating function, recurrence relations and orthogonality of Legendre polynomial

Master of Science (Mathematics)
Semester-I
Session: 2024-26
Course Title: Differential Equations
Course Code: MMSL-1335

Examination Time: 3 Hrs

LTP
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

Existence and uniqueness theorem for IVP in ODEs, 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, orthogonal trajectories, Sturm Liouville's boundary value problems. Sturm comparison and Separation theorems, Orthogonality solution.

Unit-II

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-III

Fourier Transform: Definition, existence, and basic properties, Convolution theorem, Fourier transform of derivatives and Integrals, Inverse Fourier transform, solution of linear ordinary differential equations, Complex Inversion formula.

Unit-IV

Special Functions: Solution, Generating function, recurrence relations and othogonality of Legendre polynomial, Bessel functions, Hermite and Laguerre polynomials.

Reference Books:

1. Rainvile, E.D., Special Functions, Chelsea Publications Co., 1971.
2. Piaggio, H.T.H., Differential equations, C.B.S.Publications,2004.
3. Ross, S.L.: Differential equations, Wiley Publications,2007.
4. Pinkus, A. and Zafrany, S., Fourier series and Integral Transforms, Cambridge University Press, 1997.

KANYA MAHA VIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF TWO YEAR DEGREE PROGRAMME

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics)

(Session 2024-2026)

Semester-II										
Course Code	Course Title	Course Type	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Th	P	CA	
MMSL-2331	Number Theory	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-2332	Linear Algebra	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-2333	Algebra-II	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-2334	Mechanics-II	C	6-0-0	6-0-0	6	100	80	-	20	3
MMSL-2335	Measure Theory	C	6-0-0	6-0-0	6	100	80	-	20	3
TOTAL					30	500				

C-Compulsory Course

Master of Science Mathematics
Semester-II
Session 2024-26
Course Title: Number Theory
Course Code: MMSL-2331
Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Solve system of given linear and non linear congruences. Further the student will be able to apply the Wilson's theorem to solve numerical problems.

CO 2: Understand the properties and application of Quadratic residue and corresponding symbols.

CO 3: Find integral solutions of specified Diophantine equation and understand the criterion for an integer to be expressed as sum of two squares and sum of four squares.

CO 4: Understand the basic concept of periodic and purely periodic continued fractions and apply the Pell's equation to real life problems.

Master of Science (Mathematics)

Semester-II
Session 2024-26
Course Title: Number Theory
Course Code: MMSL-2331

Examination Time: 3 Hrs

LT P
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Simultaneous Linear Congruences, Chinese Remainder theorem, Wolsten- Holme's theorem, Lagrange's proof of Wilson theorem, Fermat numbers, The order of an integer modulo n. Primitive roots, Existence and number of primitive roots.

Unit-II

Indices and their applications, Quadratic residues, Euler's criterion, Product of Quadratic residues and Quadratic non-residues, The Legendre symbol and its properties, Gauss's Lemma, Quadratic reciprocity law, Jacobian symbol and its properties.

Unit-III

Arithmetic functions $\mathcal{C}(n)$, $\sigma(n)$, $\sigma_k(n)$, $\mu(n)$, Perfect numbers, Mobius Inversion formula, Diophantine equation $x^2+ y^2= z^2$and its applications to $x^n+ y^n= z^n$, when n = 4. Criterion for an integer to be expressible as sum of two squares and sum of four squares.

Unit-IV

Farey series, Farey dissection of a circle and its applications to approximations of irrationals by rationals, Finite and Infinite simple continued fractions, periodic and purely periodic continued fractions, Lagrange's Theorem on periodic continued fractions. Applications to Pell's equation. The fundamental solution of Pell's equation.

ReferenceBooks:

1. Hardy, G.H. and Wright, E.M., An Introduction to the Theory of Numbers, Oxford University Press, 2008.
2. Niven, I., Zuckerman, S.H. and Montgomery L.H., An Introduction to Number Theory, Wiley Publication, 2008.
3. Burton, D.M., Elementary Number Theory, Mc Graw Hill Education, 2017.

Master of Science (Mathematics)
Semester-II
Session 2024-26
Course Title: Linear Algebra
Course Code: MMSL-2332
Course Outcomes

After passing this course, the students will be able to:

CO1:To understand the concept of vector space, Quotient Spaces, Basis and Dimension and Linear transformations.

CO2: To understand matrix representation of a linear transformation, Elementary matrix operations and rank of a matrix.

CO3: To find eigen values and eigenvectors of a matrix, Diagonalization, Linear Functionals, Dual Spaces and dual basis.

CO4: To identify Inner Product Spaces, The Gram-Schmidt Orthogonalization, Orthogonal Complements, Normal and Self-Adjoint Operators, Unitary and Normal Operators.

Master of Science (Mathematics)
Semester-II
Session 2024-26
Course Title: Linear Algebra
Course Code: MMSL-2332

Examination Time: 3 Hrs

LT P | Max. Marks: 100
6 0 0 | Theory: 80
CA: 20

Instructions for the paper setters/examiners

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Vector spaces, Subspaces, Quotient Spaces, Basis and Dimension Theorems, Sum of subspaces, Direct sum decompositions, Linear transformations, The Algebra of linear transformations.

Unit-II

Matrices associated with linear transformations, effect of change of ordered bases on the matrix of linear transformation, Elementary matrix operations and Elementary matrices, Row rank, Column rank and their equality, system of linear equations

Unit-III

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

Unit-IV

Inner Product Spaces, The Gram-Schmidt Orthogonalization, Orthogonal Complements, The Adjoint of a linear operator on an inner product space, Normal and Self-Adjoint Operators, Unitary and Normal Operators

Reference Books:

1. Hoffman, K.andKunze, R., Linear Algebra, Second Edition, Prentice Hall India Learning, 2015.
2. Friedberg, S.H., Insel, A.J, Spence, L.E., Linear Algebra, Fourth Edition, Prentice Hall, 2003.
3. Lang, S., Linear Algebra, Third Edition, Springer-Verlag,1987.

Master of Science (Mathematics)
Semester-II
Session: 2024-26
Course Title: Algebra-II
Course Code: MMSL-2333
Course Outcomes

After passing this course, the students will be able to:

CO 1: State the definitions of ring, subring, ideal, ring homomorphism.

CO 2: State definitions of important classes of rings associated with factorization: Unique Factorization Domain, Principal Ideal Domain, and Euclidean Domains. Show that a given ring falls into one of these classes (or not). Relate these classes of rings to each other.

CO 3: Explain the notion of an extension of a field. State the definitions and examples of algebraic extension, finite extension, simple extension, separable extensions, splitting field and Galois extension. Identify in specific examples whether an extension satisfies one of these properties.

CO 4: Describe Galois field. Relate the concept of solvability by radicals to Galois groups and State the definition of constructible point, line and number. Relate constructability to field extension degrees.

Master of Science (Mathematics)
Semester-II
Session: 2024-26
Course Title: Algebra-II
Course Code: MMSL-2333

Examination Time: 3 Hrs

LTP	Max. Marks: 100
6 0 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Rings, Subrings, Ideals, Factor Rings, Homomorphism, Integral Domains. Maximal and prime ideals.

Unit-II

The field of Quotients of an integral domain.Principal Ideal domains, Euclidean Rings. The ring of Gaussian Integers, Unique Factorization domains, Polynomial Rings, Gauss's theorem and irreducibility of a polynomial.

Unit-III

Extension Fields: Finite and Infinite, Simple and Algebraic Extensions, Splitting fields: Existence and uniqueness theorem.

Unit-IV

Separable and inseparable extensions, perfect fields, finite fields, Existence of GF(p^n), construction with straight edge ruler and compass.

Text Books:

1. Herstein, I.N.: Topics in Algebra, Willey Eastern1975.
2. Fraleigh, J.B, An Introduction to Abstract Algebra, Pearson Education Publication Ltd., 2008.

Reference Books:

1. Singh,S.and Zameeruddin, Q. Modern Algebra, Vikas PublicationPvt.Ltd.,2006.
2. Bhattacharya, P.B.,Jain,S.K.,andNagpal,S.R.,BasicAbstractAlgebra,Ch-14(Sec.1-5), 1994.

Master of Science (Mathematics)
Semester-II
Session: 2024-26
Course Title: Mechanics – II
Course Code: MMSL-2334
Course Outcomes

On the Successful completion of this course, the students will be able to

CO 1: Define general motion of a rigid body, linear momentum of a system of particles, angular momentum of a system, use of centroid, moving origins and impulsive forces. Illustrate the laws of motion, law of conservation of energy and impulsive motion.

CO 2: Manage to solve Euler's dynamical equation for the motion of a rigid body about a fixed point and state the properties of a rigid body motion under no force.

CO 3: Understand the concept of generalized coordinates and velocities, virtual work, generalized forces and solve Lagrange's equation for a holonomic system and impulsive forces. Demonstrate the concept of Kinetic energy as a quadratic function of velocities and equilibrium configuration for conservative holonomic dynamical systems.

CO 4: Define linear functional. Use Euler's-Lagrange's equations of motion for single independent and single dependent variable. Recognize Brachistochrone problem, Hamilton's Principle, Principle of Least action, differentiate between Hamilton's Principle and the Principle of Least action. Find approximate solution of BVP using Rayleigh-Ritz Method.

Master of Science (Mathematics)
Semester-II
Session: 2024-26
Course Title: Mechanics -II
Course Code: MMSL-2334

Examination Time: 3 Hrs

LTP
6 0 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

General motion of a rigid body, linear momentum of a system of particles. Angular momentum of a system, use of centroid , moving origins, impulsive forces. Problems in two-dimensional rigid body motion, law of conservation of Angular momentum, illustrating the laws of motion, law of conservation of energy, impulsive motion.

Unit-II

Euler's dynamical equations for the motion of a rigid body about a fixed point, further properties of rigid body motion under no forces. Problems on general three-dimensional rigid body motion.

Unit-III

Generalized co-ordinates and velocities, Virtual work, generalized forces. Lagrange's equations for a holonomic system and their applications to small oscillation. Lagrange's equations for impulsive forces. Kinetic energy as a quadratic function of velocities. Equilibrium configurations for conservative holonomic dynamical systems. Theory of small oscillations of conservative holonomic dynamical systems.

Unit-IV

Linear functional, Extremal. Euler's - Lagrange's equations of single independent and single dependent variable. Brachistochrone problem, Extension of the variational method. Hamilton's Principle, Principle of Least action. Distinctions between Hamilton's Principle and the Principle of Least Action. Approximate solution of boundary value problems:- Rayleigh-Ritz Method.

Reference Books:

1. Chorlton,F.,TextBookofDynamics,CBSPublicationltd.,2002.
2. Elsgolts,L.,Differential equations and the calculus of variations, University Press of Pacific, 2003.
3. Gupta,A.S.,Calculus of Variation with Application,PHILearningPvt.Ltd.,1996.

Master of Science (Mathematics)
Semester-II
Session 2024-26
Course Title: Measure Theory
Course Code: MMSL-2335

After the completion of this program, students should be able to

CO 1: Understand the fundamentals concepts of measure theory which include the topics of outer measure, σ-algebra of Lebesgue measurable sets, Borel σ-algebra of subsets of real line, measurable sets, non-measurable sets,.

CO 2: Manage to understand Measurable function, characteristic function and Little wood's three principles.

CO 3: apply Lebesgue Integral on different kind of function and solve problems related to Fatou's Lemma and monotone convergence theorem.

CO 4: To understand general Lebesgue integral with Lebesgue dominated convergence theorem and to define The Vitali convergence Theorem and to apply Characterizations of Riemann and Lebesgue integrability.

Master of Science (Mathematics)

Semester-II
Session 2024-26
Course Title: Measure Theory
Course Code: MMSL-2335

Examination Time: 3 Hrs

LT P | Max. Marks: 100
6 0 0 | Theory: 80
CA: 20

Instructions for the paper setters/examiners

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Review of the topology of real line, the extended real numbers, σ-algebra, Borel-algebra and Borel sets, Lebesgue Outer Measure, Measurable Sets and their properties, σ-algebra of Lebesgue measurable sets, Outer and Inner Approximation of the Lebesgue Measurable Sets, Countable additivity of Lebesgue measure, Continuity of measure, the Borel-Cantelli Lemma, Non-Measurable Sets, The Cantor set and The Cantor-Lebesgue function, Comparison of σ- algebra of measurable sets and the Borel σ-algebra of subsets of real line.

Unit-II

The motivationbehindLebesgueMeasurableFunctions,variousCharacterizationsandProperties of Measurable functions: Sum, Product and Composition, Sequential Point-wise Limits and Simple Approximations to Measurable Functions, Littlewood's three Principles.

Unit-III

Lebesgue Integral (Stage I): Lebesgue Integral of a simple function, Comparison of Riemannand Lebesgue Integral, linearity and monotonicity of Lebesgue integration. Lebesgue Integral (Stage II): Lebesgue Integral of a bounded measurable function over a set of finite measure, linearity, monotonicity, and additivity over domain of integration, The Bounded Convergence Theorem. Lebesgue Integral (Stage III): Lebesgue Integral of a measurable function of finite support, Lebesgue Integral of a non-negative measurable function, linearity, monotonicity, and additivity over domain of integration, Fatou's Lemma, TheMonotone convergence Theorem.

Unit-IV

Lebesgue Integral (Stage IV): The General Lebesgue Integral, the integral comparison test, linearity, monotonicity, and additivity over domain of integration, The Lebesgue Dominated Convergence Theorem, General Lebesgue Dominated convergence Theorem, Countable Additivity and Continuity of Integration. Uniformly integrable family of functions, The Vitali convergence Theorem. Characterizations of Riemann and Lebesgue integrability.

Reference Books:

1. Royden, H.L. and Fitzpatrick, P.M, Real Analysis (Fourth Edition), Pearson Education Inc. New Jersey, U.S.A., (Scope as in Ch.1-6), 2010.

FACULTY OF SCIENCES

SYLLABUS
of
Master of Science (Mathematics)
(Semester: III -IV)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

Master of Science (Mathematics)

Session: 2024-25

Programme Outcomes

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

PO 1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theories of Mathematics and their applications in the real world to enhance career prospects in a huge array of field.

PO 2: Have knowledge of advanced models and methods of mathematics, including same from the research frontiers of the field and expert knowledge of a well defined field of study, based on the international level of research in Maths.

PO 3: To generate skills in independently comprehending, analysing, modelling and solving problems at a high level of abstracts based on logical & structured reasoning.

PO 4: Use computer calculations as a tool to carry out scientific investigation and develop new variants.

PO 5: Use mathematical and statistical techniques to solve well defined problems and present their mathematical work, both in oral and written format.

PO 6: Propose new mathematical linear programming techniques & suggest possible software packages or computer programming to find solution to their questions.

PO 7: Apply the knowledge in modern industry or teaching or secure acceptance in high quality graduate program in maths and other fields such as the field of quantitative/mathematical finance, mathematical computing, statistics and actuarial sciences.

PO 8: Read, Understand construct correct mathematical and use the library and electronic data basis to locate information on mathematical problem.

Master of Science (Mathematics)

Session -2024-25

Program Specific outcomes

After the successful completion of this course, the students will be able to

PSO 1: Develop a deeper and more rigorous understanding of calculus including defining terms and proving theorems about sets, functions, sequences, series, limits, continuity, derivatives, the Riemann integrals, and sequence of functions. The course will develop specialized techniques in problem solving.

PSO 2: Handle mathematical operations, analysis and problems involving complex numbers. Justify the need for a complex number system and explain how it is related to other existing number systems.

PSO 3: Understand the importance of algebraic properties with regard to working within various number systems, demonstrate ability to form and evaluate conjectures.

PSO 4: Apply differential equations to significant applied and/or theoretical problems, to model physical and biological phenomenon by differential equations and dynamical systems.

PSO 5: To describe fundamental properties including convergence, measure, differentiation and integration of the real numbers developing the theory underpinning real analysis, to appreciate how ideas and abstract methods in mathematical analysis can be applied to important practical problems.

PSO 6: To use tensor to describe measured quantities, to formulate and solve physics problems in areas such as stress, elasticity including problems in geometry, to analyze shapes in computer version and other areas of mathematical sciences.

PSO 7: To demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from field extension and Galois theory , to apply problem solving to diverse situations in physics, engineering and other mathematical contexts.

PSO 8: To understand forces linear and circular and their effects on motion, to analyze how a physical system might develop or alter over time and to study the cause of these changes.

PSO 9: To understand the concept of Relation and Function, Generation Function and Recurrence , Truth tables and its various uses in mathematics, Quantifiers, Semi Groups and Monoids, Congruence Relations

KANYA MAHA VIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF TWO YEAR DEGREE PROGRAMME

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics)

Semester-III

Course Code	Course Title	Course Type	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Th	P	CA	
MMSL-3331	Functional Analysis-I	C	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-3332	Topology-I	C	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-3333 (OPT-I)	Discrete Mathematics-I	E	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-3334 (OPT-III)	Statistics-I	E	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-3335 (OPT-IV)	Operations Research-I	E	4-1-0	4-1-0	5	100	80	-	20	3
Student can opt any one of the following interdisciplinary courses. ID Course opted in Sem-I cannot be opted in Sem-III		IDE*	4-0-0	4-0-0	4	100	80	-	20	3
TOTAL					25	500				

IDEC-3101	Communication Skills
IDEM-3362	Basics of Music (Vocal)
IDEH-3313	Human Rights and Constitutional Duties
IDEI-3124	Basics of Computer Applications
IDEW-3275	Indian Heritage: Contribution to the World
	(Credits of these courses will not be added to SGPA)

(Session 2024-2025)

C-Compulsory Course
E-Elective
*Optional (Credits of ID courses will not be added to SGPA)

Note 1:

In addition to two compulsory papers in third and fourth semester, student has to choose three optional papers in each third and fourth semester keeping in view the prerequisites and suitability of the combinations.

OPT-I Discrete Mathematics-I
OPT-II Integral Transforms
OPT-III Statistics-I
OPT-IV Operations Research-I
OPT-V Advanced Numerical Analysis
OPT-VI Discrete Mathematics-II
OPT-VII Number Theory
OPT-VIII Statistics-II
OPT-IX Operations Research-II
OPT-X Computer Programming with C

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Functional Analysis-I
Course Code: MMSL-3331
Course outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of normed linear spaces like,$L^{P(n)}l$(infinite), quotient and LP-spaces.

CO 3: Recognize the examples related to Finite dimensional normed linear spaces and compactness, conjugate space N* and understand The Hahn-Banach theorem and its consequences.

CO 3: Demonstrate the open mapping theorem, closed graph theorem and uniform bounded principal.

CO 4: Describe the concept of Inner product spaces, Hilbert spaces, orthogonal complements, orthonormal sets, the conjugate space H*.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Functional Analysis-I
Course Code: MMSL-3331

Examination Time: 3 Hrs

LTP	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Normed linear spaces, Banach spaces, subspaces, quotient spaces, L^P-spaces: Holder's and Minkowski's Inequalities, Convergence and Completeness, Riesz-Fischer Theorem, Continuous linear transformations, equivalent norms.

UNIT-II

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

UNIT-III

Open mapping theorem, projections on a Banach space, closed graph theorem, uniform boundedness principle, conjugate operators.

UNIT-IV

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

Text Book:

P. K. Jain, O.P Ahuja, Functional Analysis, New Age International (P) Ltd. Publishers, New Delhi, Second Edition, 2017

Reference Book:

D. Somasundram, A First Course in Functional Analysis, Narosa Publishing House Pvt. Ltd ,New Delhi, Seventh Edition, 2018.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Topology-I
Course Code: MMSL-3332
Course Outcomes

. Upon successful completion of this course the student will be able to:

CO 1: Demonstrate knowledge and understanding of concepts such as open and closed sets, closure and boundary, Neighbourhood's and Neighbourhood system, bases and sub – bases for a topological space etc.

CO 2: Will understand the behaviour of Connectedness on real line, Sequential continuity at point, Homeomorphism and embedding in different topological spaces.

CO 3: Know and understand the concepts related to separation axioms such as $T_{0,}$ T_1

andT_2 spaces.

CO 4: Create new topological spaces by using product topologies and quotient topologies.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Topology-I
Course Code: MMSL-3332

Examination Time: 3 Hrs
LTP
4 1 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Topological Spaces, Basic concepts :- closure, interior, exterior and boundary of a set, Dense sets, Closure operator [Kuratowski function] and Interior operator, Neighbourhood's and Neighbourhood system .Coarser and finer topologies. Local bases, bases and sub – bases for a topological space. Convergence of a sequence. First and second countable spaces. Lindeloff spaces, Separable spaces. Sub-spaces, Hereditary properties.

UNIT-II

Separated sets, connected sets, Connected and disconnected spaces, Connectedness on real line. Components, locally connected space. Totally disconnected space. Continuous functions, Restriction and extension of a mapping. Sequential continuity at point. Invariants under a continuous mapping. Open and closed mappings. Homeomorphism and embedding. Topological properties.

UNIT-III

Separation Axioms: T0, T1, T2 – spaces. Regular spaces, T3 – spaces, Normal spaces, T4 – space. Tychonoff lemma, Urysohn lemma, Tietze extension theorem.

UNIT-IV

Product of two spaces, The product of n spaces. Base for a finite product topology. General product spaces. Sub-base and base for product topology. Productive properties. Quotient spaces.

Text Book:

J. R. Munkers, Topology, Pearson Education Publisher, England, Second Edition, 2021.

Reference Books:

1. T.O. Moore, Elementary General Topology, Prentice Hall Publisher, New Jersey, 1965.
2. J. L. Kelley, General Topology, Springer, New York.
3.G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Education, 2017.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Discrete Mathematics-I
Course Code: MMSL-3333(OPT-I)
Course Outcomes

Having successfully completed this course the students will be able to:

CO 1: Work with Relations and functions and investigate their Properties.

CO 2: Use the Truth Tables for the Expressions involving the Logical Connectives, and Apply the Standard Logical Equivalences and Determine if a Logical Arguments is valid or invalid.

CO 3: Understand the concept of Semi groups and Monoids

CO 4: Learn Recursive Functions and Solve Recurrence Relations and Apply Basic and Advanced Principles of Counting.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Discrete Mathematics-I
Course Code: MMSL-3333(OPT-I)

Examination Time: 3 Hrs
LTP
4 1 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Relations and Functions: Binary elations ,Equivalence relations and partitions, Partial order relations, Inclusion and Exclusion principle, Hasse diagram ,Pigeonhole principle.

UNIT-II

Mathematical Logic : Basic logical operations, Conditional and Biconditional statements, Tautologies, Contradiction, Quantifiers, Prepositional calculus.

UNIT-III

Semi Group sand Monoids: Definition and examples of semi groups and monoids ,Homomorphism of semi groups and monoids, Congruence relations and quotient subgroups.

UNIT-IV

Recurrence Relations and Generating Functions: Polynomial expressions, Telescopic form, recursion theorem, Closed form expression, Generating function, Solution of recurrence relation using generating function.

Text Books :

A. Doer, Applied Discrete Structures For Computer Science, Galgotia Publications Pvt. Ltd., New Delhi, Reprint 1999

Reference Books ;

1.C. L Liu, Elements of Discrete Mathematics, McGraw Hill Education Revised Fourth Edition, 1 July 2017
2.V. H Patil, Discrete Mathematics, McGraw Hill Education Revised Third Edition, 1 July 2017
3.Babu Ram, Discrete Mathematics, Pearson Education India, First Edition (1 January, 2010)

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Statistics-I
Course Code: MMSL-3334(OPT-III)

Course Outcomes

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

CO 1: Distinguish between different types of data and interpret examples of methods for summarizing data sets, including common graphical tools such as histogram and summary statistics such as mean, median, mode, variance skewness and kurtosis. Further student will understand the basic concepts and applications of probability in real life scenarios

CO 2: Contrast between discrete and continuous random variable and apply general properties of expectations and variance.

CO 3: Compute probabilities for discrete and continuous distributions.

CO 4: Understand and interpret the knowledge regarding correlation of variables in real time data.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Statistics-I
Course Code: MMSL-3334(OPT-III)

Examination Time: 3 Hrs

LTP
4 1 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

UNIT-I

Measures of Central tendency and dispersion, Moments, Measures of skewness and kurtosis. Classical and axiomatic approach to the theory of probability, Additive and multiplicative law of probability, Conditional probability and Bayes' theorem. Random variable, Probability mass function, Probability density function, Cumulative distribution function.

UNIT-II

Two and higher dimensional random variables, Joint distribution, Marginal and conditional distributions, Stochastic independence, Function of random variables and their probability density functions. Mathematical expectations and moments, Moment generating function and its properties.

UNIT-III

Chebyshev's inequality and its application, Stochastic convergence, Central limit (Laplace theorem Linder berg, Levy's Theorem). Discrete Probability Distributions: Bernoulii, Binomial, Poisson, Negative Binomial, Geometric Distribution (For distributions only Mean, Variance, Moment Generating Function).

UNIT-IV

Continuous probability distributions: Uniform, Normal, Gamma, Beta, Exponential distributions (For distributions only Mean, Variance, Moment Generating Function). Least square principle, Correlation and linear regression analysis for bi-variate data. Theory of attributes: Independence of attributes, association of attributes.

Text Book:

S.C. Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, 11th edition, 2019 (Scope as in chapters 2-11, 13).

Reference Books:

1. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the Theory of Statistics, Mc Graw Hill, 3rd edition, 1974.
2. A.M. Goon, M.K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol-I, World Press, Calcutta, 8th edition, 2002.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Operations Research-I
Course Code: MMSL-3335 (OPT-IV)
Course outcomes

After studying this course students will be able to:

CO 1: Identify and develop operational research models from the verbal description of the real system and mathematical tools that are needed to solve optimization problems. They will be able to differentiate feasible, basic feasible and optimum solution of a linear programming problem and Plan optimum allocation of various limited resources such as men, machines, material, time, money etc. for achieving the optimum goal.

CO 2: Plan, forecast and make rational decisions and construct linear programming and integer linear programming models. They will be able to identify the situations where integer linear programming models are desirable and discuss the solution techniques and applications of linear programming. Understand and apply the Duality concepts to find the solutions of the primal problem and the relationship between the primal and dual linear programming problems.

CO 3: Analyze the transportation and assignment problems and solve those using mathematical models. They will become able to handle cases of unequal supply and demand, unacceptable routes etc. for a transport problem and become familiar with the types of problems such as travelling salesman problem that can be solved by applying an assignment model.

CO 4: Solve Zero Sum games, games without saddle points, graphical solution of 2*n and m*2 games. Able to understand approach of Dynamic Programming and find the solution of LPP Using Dynamic Programming.

Master of Science (Mathematics)
Semester-III
Session: 2024-25
Course Title: Operations Research-I
Course Code: MMSL-3335 (OPT-IV)

Examination Time: 3 Hrs

LTP	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non-Programmable &Non-Storage Type Calculator. The question paper must contain 30% of the article/theory from the syllabus.

UNIT-I

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

UNIT-II

General Primal-Dual pair, formulating a dual problem, primal-dual pair in matrix form, Duality theorems, complementary slackness theorem, duality and simplex method, economic interpretation of duality, dual simplex method, Integer Programming: Gomory's all I.P.P. method, constructions of Gomory's constraints, Fractional cut method-all integer and mixed integer, Branch-and-Bound method, applications of integer programming.

UNIT-III

General transportation problem, transportation table, duality in transportation problem, loops in transportation tables, LP formulation, solution of transportation problem, test for optimality, degeneracy, transportation algorithm (MODI method), Time- minimization transportation problem. Mathematical formulation of assignment problem, assignment method, typical assignment problem, the travelling salesman problem.

UNIT-IV

Game Theory: Two-person zero-sum games, maximin-minimax principle, games without saddle points (Mixed strategies), graphical solution of 2 * n and m * 2 games, dominance property, arithmetic method of n * n games, general solution of m * n rectangular games.

Dynamic Programming: The recursive equation approach, characteristics of dynamic programming, dynamic programming algorithm, solution of-Discrete D.P.P., some applications, solution of L.P.P. by Dynamic Programming.

Text Book:

K. Swarup, P.K. Gupta and M.Mohan, Operations Research, Sultan Chand & Sons, New Delhi, 19th edition, 2017. (Scope as in chapters 1, 2, 4, 5, 7, 10, 11, 13, 17)

Reference Books:

1. N.S.Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi, 2005.
2. S.D. Sharma, Operations Research, Kedar Nath Ram Nath, Merrut,15th edition, 2010
3. H.A. Taha, Operations Research, Pearson Education Limited, England, 10th edition, 2017.

KANYA MAHA VIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF TWO YEAR DEGREE PROGRAMME

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (Mathematics)

(Session 2024-2025)

Semester-IV

Course Code	Course Title	Course Type	Hours Per Week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Th	P	CA	
MMSL-4331	Functional Analysis-II	C	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-4332	Topology-II	C	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-4333 (OPT-VII)	Number Theory	E	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-4334 (OPT-VIII)	Statistics-II	E	4-1-0	4-1-0	5	100	80	-	20	3
MMSL-4335 (OPT-IX)	Operations Research-II	E	4-1-0	4-1-0	5	100	80	-	20	3
MMSD-4336	Project	C	0-0-10	0-0-5	5	100	-	80	20	3
TOTAL					30	600				

Note:

In addition to two compulsory papers in third and fourth semester, student has to choose three optional papers in each third and fourth semester keeping in view the prerequisites and suitability of the combinations.

OPT-I Discrete Mathematics-I
OPT-II Integral Transforms
OPT-III Statistics-I
OPT-IV Operations Research-I
OPT-V Advanced Numerical Analysis
OPT-VI Discrete Mathematics-II
OPT-VII Number Theory
OPT-VIII Statistics-II
OPT-IX Operations Research-II
OPT-X Computer Programming with C

C-Compulsory

E-Elective

Master of Science (Mathematics) Semester-IV
Session 2024-25
Course Title: Functional Analysis-II
Course Code: MMSL-4331
Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of strong and weak convergence in finite and infinite dimensional normed linear spaces and to describe the different operator like, adjoint of an operator, self-adjoint operator, and unitary operator.

CO 2: Demonstrate how to find the Eigen values and Eigen vectors for finite dimensional spaces and State and Prove Spectral Theorem for normal operators.

CO 3: Understand the concept of Compact Linear Operators on Normed space.

CO 4: To know the topological division of zeros and formulate for spectral radius and to classify the regular and singular elements.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Functional Analysis-II
Course Code: MMSL-4331

Examination Time: 3 Hrs
LTP
4 1 0

Max. Marks: 100
Theory: 80
CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each)are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Strong and weak convergence in finite and infinite dimensional normed linear spaces. Weak convergences in Hilbert spaces, Weakly compact sets in Hilbert spaces, The adjoint of an operator, Self adjoint operators, Normal operators, Unitary operators.

UNIT-II

Finite dimensional spectral Theory.: Eigen- values and Eigen vectors, Spectrum of a bounded linear operator, Spectrum of Self-adjoint, Positive and Unitary operators. Spectral Theorem for normal operators.

UNIT-III

Compact Linear Operator on Normed spaces, Properties of compact linear operators, Spectral properties of compact linear operators.

UNIT-IV

Banach algebras: Definitions and simple examples. Regular and singular elements. Topological divisors of zero, Spectrum of an element of Banach Algebra, Formula for spectral radius.

Text Book:

D. Somasundram , A First Course in Functional Analysis, Narosa Publishing House Pvt. Ltd, Seventh Reprint 2018.

Reference Books :

1.E. Kreyszig, Introductory Functional Analysis with Applications, John Wiley and Sons, Singapore, 2019

2.P. K Jain, O. P Ahuja, Functional Analysis, New Age International (P) Limited Publishers, Daryaganj, New Delhi, Third Edition, 2020

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Topology-II
Course Code: MMSL-4332
Course Outcomes

After passing this course, the students will be able to:

CO 1: Know and understand the concepts related to higher separation axioms such as Completely regular spaces, T5 – spaces and Tychonoff spaces etc.

CO 2: Understand and interpret the knowledge regarding Compact spaces, Relation of compact spaces with Hausdorff spaces, Countably compact spaces and One point compactification.

CO 3: Demonstrate knowledge and understanding of Metric spaces & Metrizability of topological spaces.

CO 4: Understand terms, definitions & theorems related to Net, Filter, Ultra filter and convergence of net and filters.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Topology-II
Course Code: MMSL-4332

Examination Time: 3 Hrs

LTP	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Higher Separation Axioms: Completely regular spaces. Tychonoff spaces, completely normal space, T5 – spaces. Metric spaces as Hausdorff regular, normal and completely normal space. Product of metric spaces.

UNIT-II

Compact spaces, Compact sets, Subsets of compact space. Finite intersection property. Compactness of subsets of real line. Relation of compact spaces with Hausdorff spaces, Regular spaces and normal spaces. Sequentially compact spaces, Bolzano Weierstrass property. Countably compact spaces. Locally compact spaces. Compactness in terms of base elements and sub – base elements. Tychonoff theorem. One point compactification.

UNIT-III

The Stone-Čechcompactification, Evaluation mappings, Separate point family, Separate point and closed set family. Embedding lemma, Tychonoff cube, Embedding theorem, Metrization. Urysohnmetrization theorem

UNIT-IV

Directed sets and nets. Convergence of a net in a space, Clustering of a net, nets and continuity, Nets in product spaces, Ultra nets. Compactness in term of nets, Topologies determined by nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. Ultra-filters and compactness.

Text Book:

J.R.Munkers, Topology, Pearson Education Publisher, England, Second Edition, 2021.

Reference Books:

1. T.O. Moore, Elementary General Topology, Prentice Hall Publisher, New Jersey, 1965.

2. J.L. Kelley, General Topology, Springer, New York.

3. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Education, 2017.

Master of Science Mathematics Semester-IV
Session 2024-25
Course Title: Number Theory
Course Code: MMSL-4333(OPT-VII)
Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Prove results involving divisibility and greatest common divisors and solve system of given linear and non linear congruences. Further the student will be able to apply the Wilson's and Euler- Fermat's theorem to solve numerical problems.
CO 2: Understand the properties and application of Quadratic residue and corresponding symbols.
CO 3: Find integral solutions of specified Diophantine equation and understand the criterion for an integer to be expressed as sum of two squares and sum of four squares.
CO 4: Understand the basic concept of periodic and purely periodic continued fractions and apply the Pell's equation to real life problems.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Number Theory
Course Code: MMSL-4333(OPT-VII)

Examination Time: 3 Hrs

LTP	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners

Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Simultaneous Linear Congruences, Chinese Remainder theorem with applications, Wolsten-Holme's theorem, Lagrange's proof of Wilson theorem, Fermat numbers, Order of an integer modulo n. Primitive roots, Existence and number of primitive roots.

UNIT-II

Indices and their applications, Quadratic residues, Euler's criterion, Product of quadratic residues and quadratic non-residues, Legendre symbol and its properties, Gauss's Lemma, Quadratic reciprocity law, Jacobian symbol and its properties..

UNIT-III

Arithmetic functions τ (n), σ (n), σ_k (n), μ (n), Perfect numbers, Mobius inversion formula, Diophantine equation $x^2 + y^2 = z^2$and its applications to $x^n + y^n = z^n$ when n=4. Criterion for an integer to be expressible as sum of two squares and sum of four squares.

UNIT-IV

Farey series, Farey dissection of a circle and its applications to approximations of irrationals by rationals. Finite and Infinite simple continued fractions, periodic and purely periodic continued fractions, Lagrange's Theorem on periodic continued fractions. Applications to Pell's equation, Fundamental solution of Pell's equation.

Text Books

1. D. M. Burton, Elementary Number Theory, McGraw Hill, 7th edition, 2010 (Scope as in Chapters: 4, 6-8, 11-13, 15).

2. G.H. Hardy and E.M. Wright, Theory of Numbers, Oxford University Press, 6th edition, 2008 (Scope as in Chapter: 7).

Reference Book:

Niven and H.S. Zuckerman, An Introduction to the Theory of Numbers, Wiley Publication, 5th edition, 2008.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Statistics-II
Course Code: MMSL-4334(OPT-VIII)

Course Outcomes

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

CO 1: Understand the concept of sampling distribution of statistics and in particular describe the behaviour of sample mean, sample variance and order statistics and to distinguish between population and sample and between parameter and statistic.

CO 2: Describe the property of unbiasedness, consistency, sufficiency, efficiency, uniqueness and completeness and to recognize M.P. test, UMP test and BLUE.

CO 3: Identify the Applications of Chi-square, t and F Distributions in terms of different tests and Compute or approximate the probable value of test statistic and explain two types of errors.

CO 4: Demonstrate the techniques of one way and two ways ANOVA.

Master of Science (Mathematics)

Semester-IV
Session 2024-25
Course Title: Statistics-II
Course Code: MMSL-4334(OPT-VIII)

Examination Time: 3 Hrs

LT P	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

UNIT-I

Sampling Distributions: Chi-square, t and F-distributions with their properties, distribution of sample mean and variance, distribution of order statistics and sample range from continuous populations.

UNIT-II

Point Estimation: Estimators, Properties of unbiasedness, consistency, sufficiency, efficiency, uniqueness and completeness, methods of estimation, Testing of Hypothesis: Null hypothesis and its test of significance, simple and composite hypothesis, M.P. test, UMP test, BLUE

UNIT-III

Likelihood ratio test (without properties), Applications of Sampling Distributions: Test of mean and variance in the normal distribution, Tests of single proportion and equality of two proportions, Chi-square test, t-test, F-test.

UNIT-IV

Analysis of variance, analysis of variance for one way and two-way classified data with one observation per cell.

Text Book:

S.C. Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand and Sons, 2019

Reference Book

A.M. Goon, M.K. Gupta and B. Dasgupta, Fundamentals of Statistics, Vol-I, 8th edition, World Press, Calcutta, 2002.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Operations Research-II
Course Code: MMSL-4335 (OPT-IX)
Course Outcomes

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

CO 1: Identify where waiting line problems occur and realize why it is important to study such problems. Understand how Poisson distribution is used to describe arrivals and exponential distribution to describe service times. Study operating characteristics of a queuing model: Single Service Channel with Poisson arrivals, exponential service times and finite or infinite calling population.

CO 2: Study operating characteristics of a queuing model: Multi Service Channel with Poisson arrivals, exponential service times and finite or infinite calling population. Learn where inventory costs occur and why it is important to hold Inventory. Learn Economic order quantity model and extend its basic approach to inventory systems involving production lot size, planned shortages and quantity discounts.

CO 3: Decide optimal replacement policy of an item that deteriorates gradually and of an item that fails suddenly. Apply various techniques to find optimum replacement age of an item so that cost is minimized.

CO 4: Understand what simulation is and how it is helpful in the analysis of a problem. Discuss simulation of inventory models, queuing system, maintenance problems and job sequencing.

Master of Science (Mathematics)
Semester-IV
Session 2024-25
Course Title: Operations Research-II
Course Code: MMSL-4335 (OPT-IX)

Examination Time: 3 Hrs

LTP	Max. Marks: 100
4 1 0	Theory: 80
	CA: 20

Instructions for the paper setters/examiners:

Eight questions of equal marks (16 marks each)are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The students can use only Non-Programmable&Non-Storage Type Calculator.

Unit-I

Queuing Theory: Introduction, Queuing System, elements of queuing system, distributions of arrivals, inter arrivals, departure and service times. Classification of queuing models, Single
Service queuing model with infinite capacity (M/M/1): (∞/FIFO), Queuing Model: (M/M/1): (N/FIFO), Generalized Model: Birth-Death Process

Unit-II

(M/M/C):(∞/FIFO), (M/M/C):(N/FIFO), (M/M/R):(K/GD), Power supply model, Inventory Control: The inventory decisions, costs associated with inventories, factors affecting Inventory control, Economic Order Quantity (EOQ), Deterministic inventory problems with no shortages 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, Recruitment and Promotion problem, Equipment Renewal problem.

Unit-IV

Need of simulation, methodology of Simulation, Simulation models, event-type Simulation, generation of random numbers, Monte-Carlo Simulation, Simulation of inventory problems, Queuing systems, Maintenance problem, Job sequencing.

Text Book:

K. Swarup, P.K. Gupta and M.Mohan, Operations Research, Sultan Chand & Sons, New Delhi, 19th edition, 2017. (Scope as in chapters 18, 19, 21`, 22)

Reference Books:

1. N.S.Kambo, Mathematical Programming Techniques, Affiliated East-West Press Pvt. Ltd., New Delhi, 2005.

2. G. Hadley, Linear Programming, Addison-Wesley Publishing Company, 1962.
3. H.A. Taha, Operations Research, Pearson Education Limited, England, 10th edition, 2017.
4. R. Panneerselvam, Operations Research, PHI Learning Private Limited, New Delhi, 2nd edition, 2009

Master of Science (Mathematics) Semester-IV
Session 2024-25
Course Title: Project
Course Code: MMSD-4336
Course Outcomes

After passing this course, the students will be able to:

CO 1: To understand the basic framework of research process.

CO 2: To understand the primary characteristics of research and to identify various sources of information for literature review and data collection.

CO 3: To learn how to design a project and will be accustomed to work independently and confidently.

CO 4: To understand the formulation of Mathematical Problem based on real time applications.

Master of Science (Mathematics) Semester-IV
Session 2024-25
Course Title: Project
Course Code: MMSD-4336

The students will do project work primarily focusing on educational research for the resurgence of quality education as a whole through research practices.

To monitor the progression of the students, CP-I, MST, CP-II will be conducted accordingly. In end semester examination, students will be evaluated on the basis of viva-voce and project report as perexamination policy of Kanya Maha Vidyalaya.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Four Year Undergraduate Degree Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Bachelor of Arts/ Bachelor of Science /Honours (Mathematics)

Semester-I

Session: 2024-25

Bachelor of Arts/ Bachelor of Science /Honours (Mathematics) Semester-I											
Programme Name	Course Code	Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
							Total	Ext.		CA	
								Th	P		
Bachelor of Arts/ Bachelor of Science /Honours	BARL-1333 BECL-1333 BSNL-1333 BCSL-1333	Algebra	DSC	4-0-0	4-0-0	4	100	80	-	20	3
Bachelor of Arts/ Bachelor of	BARP-1333 BECP-1333	Algebra Laboratory					25	-	20	5	3

Science /Honours	BSNP-1333 BCSP-1333			0-0-2	0-0-1	1					

DSC-Discipline Specific Course

Bachelor of Arts/ Bachelor of Science /Honours
Semester–I
Session: 2024-25
Course Title: Algebra

Course Code: BARL/ BECL/ BCSL/ BSNL-1333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of matrix congruence of skew symmetric matrices and its reduction in real field. Solve system of linear equations.

CO 2: Obtain Eigen values, Eigen vectors, minimal and characteristic equation of a matrix and to apply it in advanced dynamics and electric current.

CO 3: Classify real quadratic form in variables, definite, semi- definite and indefinite real quadratic form.

CO 4: To find the relations between the roots and coefficients of general polynomial equation in one variable, distinguish between solution of cubic equations and Bi-quadratic equations.

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Bachelor of Arts/ Bachelor of Science /Honours
Semester–I
Session: 2024-25
Course Title: Algebra
Course Code: BARL/ BECL/ BCSL/ BSNL-1333

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80
4 0 0 | CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Partitioning of Matrices, Matrices Partitioned conformably for Multiplication, Rank of a Matrix, Normal form, Row rank, Column rank of a matrix, Equivalence of column and row ranks, rank of product of matrices, Linear independence of row and column vectors 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

Eigenvalues, Eigenvectors, Hermitian Matrix, Skew Hermitian matrix and unitary matrix and properties of Eigen value, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.

Unit-III

Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field. Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Reduction in the real field. Classification of real quadratic forms in n 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 of degree n in one variable. Vieta ‘s Formula, Fundamental Theorem of Algebra (Statement only) Transformation of equations, Equations of Squared differences, Solution of cubic equations by Cardan method, Discriminant of polynomial equation, Discriminant of Cubic equation, nature of roots of cubic, Solution of Biquadratic by Ferrari’s Method with illustrations, Descartes’s Rules of Signs with illustrations.

Text Books:-

1. Shanti Narayan and P.K. Mittal: Text Book of Matrices.
2. K.B. Datta : Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

Reference Book:-

1. Tom M. Apostol: Calculus: An Indian Adaptation, Wiley India, 2023

Bachelor of Arts/ Bachelor of Science /Honours
Semester–I
Session: 2024-25

Course Title: Algebra Laboratory

Course Code: BARP/ BECP/ BCSP/ BSNP-1333

Examination Time: 3 Hours | Max. Marks: 25
Practical: 20
CA:5

L T P
0 0 1

List of Practicals (using any package)

1. Introduction to the computer package in the practicals.
2. Matrix operations: addition, multiplication, inverse. transpose, determinant of matrix.
3. Find Rank of matrix: Row Rank, Column Rank.
4. Find row reduced echelon form
5. Create the coefficient matrix A and vector b. Solve for x using the inverse, using the built-in function.
6. Solving a linear system, using Gauss elimination numerically.
7. Finding eigenvalues and eigenvectors, numerically.

Reference Books:-

1. S.S. Sastry, Engineering Mathematics - Volume I (4th Edition), PHI, 2008.
2. S.S. Sastry, Engineering Mathematics - Volume II (4th Edition), PHI, 2008.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Four Year Undergraduate Degree Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Bachelor of Arts/ Bachelor of Science /Honours (Mathematics)
Semester-II

Session: 2024-25

Bachelor of Arts/ Bachelor of Science /Honours (Mathematics) Semester-II											
Programme Name	Course Code	Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
							Total	Ext.		CA	
								Th	P		
Bachelor of Arts/ Bachelor of Science /Honours	BARL-2333 BECL-2333 BSNL-2333 BCSL-2333	Calculus	DSC	4-0-0	4-0-0	4	100	80	-	20	3
Bachelor of Arts/ Bachelor of Science /Honours	BARP-2333 BECP-2333 BSNP-2333 BCSP-2333	Calculus Laboratory		0-0-2	0-0-1	1	25	-	20	5	3

Bachelor of Arts/ Bachelor of Science /Honours		Statistical Analys Using Excel	SEC	1-0-0	1-0-0	1	25	20	-	5	3
Bachelor of Arts/ Bachelor of Science /Honours		Statistical Analysis Using Excel Laboratory	SEC	0-0-4	0-0-2	2	50	-	40	10	3

DSC-Discipline Specific Course

SEC-Skill Enhancement Course

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Calculus

Course Code: BARL/BECL/ BCSL/BSNL-2333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand real number system, limit of a function, basic properties of limit, continuity, and classification of discontinuities & to apply it in real world problem.

CO 2: To Classify the difference between Hyperbolic and Inverse Hyperbolic functions and understand the concept of Taylor's and Maclaurin theorem with its applications.

CO 3: Demonstrate Asymptotes and De Moivre's theorem (for integer and Rational index) and its applications, primitive nth roots of unity.

CO 4: To understand the concepts of definite integrals and their properties and Reduction Formulae & to apply in a wide variety of disciplines like Bio, Eco, Physics & Engineering.

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Calculus

Course Code: BARL/BECL/ BCSL/BSNL-2333

Examination Time: 3 Hours	Max. Marks: 100
L T P	Theory: 80
4 0 0	CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Real number system and its order properties: lub, glb of sets of real numbers, Completeness property, Archimedean property, Dense property of Rational numbers, Limit of a function of real variable, Properties of Limits, Squeeze Theorem, Continuous function and classification of discontinuities, Differentiability of a function of real variable, Concavity and Convexity of function, Point of inflexion.

Unit-II

Derivatives of Hyperbolic and Inverse Hyperbolic functions, nth order derivatives, Leibnitz theorem on nth derivative and its applications, Taylor's and Maclaurin theorem with Lagrange form of remainder, Application of Taylor's theorem in error estimation; Taylor's series expansions of $Sinx, Cosx, e^{cosx}. logx$ etc. Indeterminate forms and L'Hopital rule.

Unit-III

Asymptotes, Horizontal Asymptotes, Vertical Asymptotes, Oblique Asymptotes, Asymptotes of general Rational Algebraic Curve with illustrations, Intersection of curve and its Asymptotes, de Moivre's theorem (for integer and Rational index) and its applications, primitive nth roots of unity.

Unit-IV

Integration of hyperbolic functions, Properties of definite integral, Reduction formulae of type

$\tan^n x\, dx, \int \cot^n x\, dx, \int \sec^n x\, dx, \int \operatorname{cosec}^n x\, dx, \int x\cos^n x\, dx, \int \cos^m x \sin nx\, dx,$

Reduction formulae of using rule of smaller index +1 of type

$\int_0^{\frac{\pi}{2}} \sin^n x \cos^n x\, dx, \int_0^{\frac{\pi}{2}} \cos^n x\, dx, \int_0^{\frac{\pi}{2}} \sin^n x\, dx$

Text Books:-

1. S. Narayan and P.K.Mittal: Integral Calculus.Sultan Chand & Sons.
2. Gorakh Prasad, Differential Calculus (19^{th} ed.). Pothishala Pvt. Ltd. Allahabad,2016.

Reference Books:-

1. Tom M.A postol, Calculus: An Indian Adaptation, Wiley India,2023.
2. MurrayR.Spiegel, Theory and Problems of Advanced Calculus, Schaum' soutlineseries, Schaum Publishing Co.NewYork.

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Calculus Laboratory

Course Code: BARP/ BECP/ BCSP/ BSNP-2333

Examination Time: 3 Hours Max. Marks: 25

Practical: 20
CA:5

L T P
0 0 1

List of Practicals (using any package)

1. Plotting graphs of elementary functions eax+b sin(bx+c) , 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 graphs.
2. Plotting the graphs of the polynomial of degree 4 and 5, the derivative graph, the second derivative graph
3. Tracing of conics in Cartesian coordinates and using the general equation of second degreein x and y.
4. Tracing of conicoids: Ellipsoid, Hyperbolic paraboloid, Elliptic paraboloid, Hyperboloid ofone and two sheets etc.
5. Graphs of hyperbolic functions.
6. Approximation of limit.
7. Approximations of derivatives.

Reference Books:-

1. S.S. Sastry, Engineering Mathematics -Volume I (4^{th} Edition), PHI, 2008.
2. S.S. Sastry, Engineering Mathematics -Volume II (4^{th} Edition), PHI, 2008.

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Statistical Analysis using Excel
Course Code:

After passing this course, the students will be able to:

CO:1 Introduce the meaning of statistics, Collection, presentation and interpretation of data with the help of excel.

CO:2 To Enhance the knowledge of Measures of dispersion, Skewness and Bowley's co-efficient of skewness and Kurtosis.

CO:3 To comprehend the concept of Correlation and its methods with rank correlation coefficient.

CO:4 To understand the concept of Linear Regression, regression Yon X, regression X on Y, Regression Coefficient, Difference between regression and Correlation, and calculation of these using MS excel.

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Statistical Analysis using Excel
Course Code:

Examination Time: 3 Hours Max. Marks: 25

Theory: 20
L T P CA: 5
1 0 0

Instructions for Paper Setters:

Eight questions of equal marks (4 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions.

Unit-I

Introduction to statistics, functions of statistics, collection of data, presentation of data, tabulation of data, charting of data, introduction to excel/spss, graphs in excel, measures of central tendency-, mean, median - meaning and computation, mode- meaning and computation, weighted average mean, geometric mean and harmonic mean.

Unit-II

Measures of dispersion, types of dispersion- range, quartile deviation, mean deviation, standard deviation, co-efficient of variation. Skewness- Karl Pearson co-efficient of skewness, Bowley's co-efficient of skewness and Kurtosis.

Unit-III

Correlation, Types of correlation, positive, negative, linear. methods of correlations – Karl Pearson's Co-efficient of correlation, rank correlation coefficient.

Unit-IV

Regression analysis- Linear Regression, regression Yon X, regression X on Y, Regression Coefficient, Relations between regression coefficients and correlation coefficients, Difference between regression and Correlation, Calculation of these using MS excel.

Reference Books:-

3. SC Gupta, Fundamentals of Mathematical Statistics, Himalaya Publication.
4. Data Analysis with Microsoft Excel by K. Berk, Partrick Carey.

Bachelor of Arts/ Bachelor of Science /Honours
Semester–II

Session: 2024-25

Course Title: Statistical Analysis Using Excel Laboratory
Course Code:

Examination Time: 3 Hours | Max. Marks: 50

Practical: 40
C A: 10

L T P
0 0 2

List of Practicals (using excel)

1. Introduction of basics of excel and functions such as 'sum', 'count', 'countif', 'max', 'min','sort' etc.
2. To prepare result from the data on marks and number of credits in a given number of courses of a class based on total marks, marks obtained, percentage of marks obtained, grades, and determine SGPA for each student.
3. Create frequency distribution table; plot histogram, bar chart, pie chart, etc.
4. Plotting two dimensional graphs.
5. To find measures of central tendency for a given data.
6. To find measures of dispersion for a given data.
7. To find measures of skewness and kurtosis for a given data.
8. To find Karl Pearson Coefficient of correlation and rank correlation coefficient for a givendata.
9. To find regression coefficient for bivariate data and plotting regression lines.

Reference Books:-

3. S. C. Gupta, Fundamentals of Mathematical Statistics, Himalaya Publication.
4. K. Berk, Partrick Carey, Data Analysis with Microsoft Excel.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
Scheme and Curriculum of Examinations of Three Year Degree Programme
(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester-III
Session: 2024-25

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-III												
Programme Name	Course Code		Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
								Total	Ext.		CA	
									Th	P		
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-3333 BECM-3333 BSNM-3333 BCSM-3333	(I)	Mathematics (Analysis)	E/C	4-0-0	4-0-0	4	100	80	-	20	3
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science(No	BARM-3333 BECM-3333 BSNM-3333 BCSM-3333	(II)	Mathematics (Analytical Geometry)		3-0-0	3-0-0	3	75	60	-	15	3

n-Medical) Bachelor of Science (Computer Science												

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)

Semester-III

Session: 2024-25

Course Title: Mathematics (Analysis)

Course Code: BARM/ BECM/ BCSM/ BSNM-3333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate an understanding of limits and how they are used in sequences.

CO 2: Understanding how limits are used in series and apply various test on series.

CO 3: To understand the concepts of Riemann sum, partitions, upper and lower sums, Riemann Integrability of continuous functions and of monotone functions. Distinguish between the absolute convergence and conditional convergence.

CO 4: To know and describe the converging behaviour of improper integrals and Beta , Gamma functions. To find the relation between Beta and Gamma functions.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–III
Session: 2024-25
Course Title: Mathematics (Analysis)
Course Code: BARM/ BECM/ BCSM/ BSNM-3333(I)

Examination Time: 3 Hrs | Max. Marks: 100

L T P

4 0 0 | Theory: 80

CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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.

Text Book:

A. Kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, New York, 2014.

Reference Books:

1.S. C Malik and S. Arora, Mathematical Analysis, New Age international Publishers, New Delhi, second edition, 2005.
2.T. M. Apostal, Mathematical Analysis, Pearson education, second edition, 2004.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–III
Session: 2024-25
Course Title: Mathematics (Analytical Geometry)
Course Code: BARM/ BECM/ BCSM/ BSNM-3333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of the geometry of lines, shifting of origin and rotation of axis in the Euclidian plane.

CO 2: Develop geometry with a degree of confidence and will gain fluency in the basics of parabola in Euclidian geometry.

CO 3: Demonstrate the concept of ellipse and hyperbola in general quadratic equation.

CO 4: Understand the concept of geometry and real time characteristics of plain and spheres.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–III
Session: 2024-25
Course Title: Mathematics (Analytical Geometry)
Course Code: BARM/ BECM/ BCSM/ BSNM-3333(II)

Examination Time: 3 Hours | Max. Marks: 75

L-T-P | Theory: 60

3 0 0
CA:15

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Transformation of axes, shifting of origin, Rotation of axes in two dimension and three dimensions, the invariants, Joint equation of pair of straight lines, equations of bisectors

Unit-II

Parabola and its properties. Tangents and normal, 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 normal, Pole and polar. pair of tangents at a point, Chord of contact, Identifications of curves represented by second degree equation (including pair of lines).

Unit-IV

Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. 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 with respect to a sphere, radical planes.

Text Book:

S.L. Loney, The Elements of Coordinate Geometry, Arihant Publications, Sixth edition, 2016.

Reference Books:

1. G. Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Private Limited, Allahabad, 2000.
2. S. Narayan and P.K. Mittal, Analytical Solid Geometry, S. Chand & company, Seventeenth edition, 2007.

3. E. Kreyszig, Advanced Engineering Mathematics, Wiley Publisher, Tenth edition, 2010.
4. G.B. Thomos, and R.L. Finney, Calculus and Analytic Geometry, Addison Wesley, Ninth edition, 1995.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
Scheme and Curriculum of Examinations of Three Year Degree Programme
(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester-IV
Session: 2024-25

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-IV												
Programme Name	Course Code		Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
								Total	Ext.		CA	
									Th	P		
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-4333 BECM-4333 BSNM-4333 BCSM-4333	(I)	Mathematics (Statics and Vector Calculus)	E/C	4-0-0	4-0-0	4	100	80	-	20	3
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science(No	BARM-4333 BECM-4333 BSNM-4333 BCSM-4333	(II)	Mathematics (Solid Geometry)		3-0-0	3-0-0	3	75	60	-	15	3

n-Medical) Bachelor of Science (Computer Science												

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2024-25
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-4333(I)

Course Outcomes

After passing this course, the students will be able:

CO 1: To apply parallelogram law of forces, triangle law of forces, Lami's theorem to real life problems and also understand that how one can resolve number of coplanar forces, parallel forces and concurrent forces acting at a body.

CO 2: To find the applications of CG of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

CO 3: To find the values of gradient, divergence and curl operator of given vectors

CO 4: To find the application of Gauss theorem, Green's theorem and Stokes's theorem in real life problems.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2024-25
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-4333(I)

Examination Time: 3 Hours | Max. Marks: 100

L-T-P | Theory: 80

4 0 0
CA:20

Instructions for the Paper Setter: Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami's Theorem(ג-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, and Vector integration.

Unit-IV

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

Reference Books:

1. N.P. Bali, Statics, Laxmi Publications, Sixth edition, 2007.
2. M.R. Spiegal, Vector Analysis, Schaum's outline Series, McGraw Hill, Second edition, 2017.
3. S.L. Loney, The Elements of Statics and Dynamics, Arihant Publications, Sixth edition, 2016.
4. R.S. Verma, A Text Book on Statics, Pothishala Private Limited, Allahabad, 1962.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2024-25
Course Title: Mathematics (Solid Geometry)
Course Code: BARM/BECM/ BCSM/BSNM-4333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of cylinder, enveloping cylinder and its limiting form.

CO 2: Demonstrate the concept of cone, classification of cone, intersection of line and cone, reciprocal cone.

CO 3: Describe the concept of conicoid or quadratic surface, its classification, trace different types of conicoid and hence find surface of revolution.

CO 4: Describe the concept of tangent and normal plane to the conicoid and Identify the conicoid, representing it in the form of hyperboloid, ellipsoid, paraboloid.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2024-25
Course Title: Mathematics (Solid Geometry)
Course Code: BARM/BECM/ BCSM/BSNM-4333(II)

Examination Time: 3 Hours | Max. Marks: 75

L-T-P | Theory: 60

3 0 0
CA:15

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Cylinder as surface generated by a line moving parallel to a fixed line and through 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 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 2nd degree S = 0. Tangent lines, tangent planes and Normal Plane.

Text Book:

P. K. Jain & Khalil Ahmed, A text book of Analytical Geometry of three dimensions, New age international limited, Second edition, 2003.

Reference Books:

1. S. Narayan, & P.K.Mittal, Analytical Solid Geometry, Sultan Chand & Sons, New Delhi, Sixteenth edition, 2002 (Scope in Chapters-7,8,11).
2. E. Kreyszig, Advance Engineering Mathematics, John Willey & Sons, tenth edition, 2011.

Scheme and Curriculum of Examinations of Three Year Degree Programme

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)

Semester-V

Session: 2024-25

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-V									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-5333 BECM-5333 BSNM-5333 BCSM-5333	(I)	Mathematics (Dynamics)	E/C	50	40	-	10	3
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-5333 BECM-5333 BSNM-5333 BCSM-5333	(II)	Mathematics (Number Theory)		50	40	-	10	3

C-Compulsory

E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2024-25

Course Title: Mathematics (Dynamics)

Course Code: BARM /BECM / BCSM/ BSNM-5333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate the basic relations between distance, time, velocity and acceleration, manage to solve the problems of Newton's Laws of Motion and the motion of particles connected by a string.

CO 2: Illustrate motion along a smooth inclined plane. Solve different types of problems with Variable Acceleration. Discuss Simple Harmonic Motion.

CO 3: Understand the concept of projectile, oscillating system.

CO 4: Define Work, Power and Energy and explain their relationship. Use measurement tools to apply the concepts of Work and power to solve real life problems. Identify the different types of energy.

Bachelor of Arts /Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2024-25

Course Title: Mathematics (Dynamics)

Course Code: BARM/ BECM/ BCSM/ BSNM-5333(I)

Examination Time:3 Hours

Max Marks:50
Theory:40
CA:10

Instructions for the paper setter:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

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, velocity and direction of motion of a projectile after a given time, projectiles on an inclined plane. 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.

Text Book:

R. Kumar, Fundamentals of Dynamics, Pardeep Publications, Jalandhar city, second edition, 2004

Reference Books:

1.F. Chorlton, Text Book of Dynamics, CBS Publishers, New Delhi, second edition, 2004 (Scope in chapters 3,8).

2. S.R. Gupta, Elementary Analytical Dynamics, S. Chand and Company, New Delhi, Fourteenth Edition, 1983(Scope in chapters 1,2,3)

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2024-25

Course Title: Mathematics (Number Theory)

Course Code: BARM/ BECM/ BCSM/ BSNM-5333(II)

Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Prove results involving divisibility and greatest common divisors.

CO 2: Find solutions of specified linear Diophantine equation, basic properties of Congruences.

CO 3: Solve system of linear congruences. Apply Fermat's and Wilson's theorem to solve numerical problems.

CO 4: Apply Euler's theorem and apply properties of phi functions in real world problems. Understand application of important arithmetic functions.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–V
Session: 2024-25
Course Title: Mathematics (Number Theory)
Course Code: BARM/ BECM/ BCSM/ BSNM-5333(II)

Examination Time:3 Hours | Max Marks:50
Theory:40
CA:10

Instructions for the Paper Setter:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

The division algorithm, The greatest common divisor, least common multiple, The Euclidean algorithm.

Unit-II

The Diophantine equation ax + by = c, Prime numbers and their distribution, the fundamental theorem of arithmetic, Basic properties of congruences.

Unit-III

Linear congruences, Special divisibility tests, Chinese remainder theorem, The Fermat's theorem, Wilson's theorem

Unit-IV

Euler's Phi function, Euler's theorem, some properties of the Phi Function, σ and τ functions, Mobius Inversion formula, Greatest integer function

Text Book:

D. M. Burton, Elementary Number Theory, Mc Graw-Hill, seventh edition, 2010.

Reference Books,

1.Niven and Zuckerman, An Introduction to the theory of Numbers, John Willey & Sons, 1991.

Scheme and Curriculum of Examinations of Three Year Degree Programme

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)

Semester-VI

Session: 2024-25

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-VI									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-6333 BECM-6333 BSNM-6333 BCSM-6333	(I)	Mathematics (Linear Algebra)	E/C	50	40	-	10	3
Bachelor of Arts Bachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-6333 BECM-6333 BSNM-6333 BCSM-6333	(II)	Mathematics (Numerical Analysis)		50	40	-	10	3

C-Compulsory

E-Elective

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session- 2024-25
Course Title: Mathematics (Linear Algebra)
Course Code: BARM/BECM/BCSM/BSNM-6333(I)
Course Outcomes

After the completion of this course, students should be able to:

CO 1: Express the algebraic concepts such as binary operation, groups, rings and fields. Define a vector space and subspace of a vector space and check the linear dependence and linear independence of vectors.

CO 2: Describe the concepts of basis and dimension of vector spaces.

CO 3: Investigate properties of vector spaces and subspaces using linear transformation.

CO 4: Find the matrix representing a linear transformation.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session: 2024-25
Course Title: Mathematics (Linear Algebra)
Course Code: BARM/BECM/ BCSM/BSNM-6333(I)

Examination Time: 3 Hours | Max. Marks:50
Theory:40
CA:10

Instructions for the paper setters/examiners:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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.

Text Book:

C.W.Curtis, Linear Algebra, Springer, New York, 2017

Reference Books:

1.S. Singh, Linear Algebra, Vikas Publishing, sixth edition, 1983.

2.V. Krishnamurthy, V. P. Mainra and J. L. Arora, An Introduction to Linear Algebra, East West Press, 1976.

3.S. Narayan and P.K. Mittal, A Text Book of Matrices, S. Chand & Co, tenth edition, 1972.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)

Semester–VI

Session: 2024-25

Course Title: Mathematics (Numerical Analysis)

Course Code: BARM/BECM/ BCSM/BSNM-6333(II)

After passing this course, the students will be able to:

CO 1. Know how to find the roots of transcendental and polynomial equations.

CO 2. Perform computation for solving a system of equations.

CO 3. Learn how to interpolate the given set of values.

CO 4. Learn numerical solution of differential equations & compute numerical integration and differentiation, numerical solution of ordinary differential equations.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session: 2024-25
Course Title: Mathematics (Numerical Analysis)
Course Code: BARM/BECM/ BCSM/BSNM-6333(II)

Examination Time: 3 Hours Max. Marks:50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

The students can use only Non Programmable& Non Storage Type Calculator.

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.

Unit-II

Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi's Method, Gauss Seidel Method. Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator. Interpolation with divided difference, Newton's formula, Lagrangian Method.

Unit-III

Finite difference interpolation, Gauss formula, Stirling formula, Bessel's formula, Error Estimation Extrapolation. Numerical differentiation, Method based on interpolation. Numerical Integration, Trapezoidal rule, Simpson's rule, Weddle rule, Romberg Integration, Gaussian integration method, Gaussian legendre integration. Double numerical integration.

Unit-IV

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.

Text Book:

M K Jain, S R K Iyenger, R K Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited, Seventh edition, 2019.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (FYIP) Physics

Semester-I

Session- 2024-25

Master of Science (FYIP) Physics (Semester-I)										
Course Code	Course Title	Course Type	Hours per week L-T-P	L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Ext.		CA	
							Th	P		
FPHL-1335	Mathematics-I	C	4-0-0	4-0-0	4	100	80	-	20	3

C-Compulsory

Master of Science (FYIP) Physics

Semester–I
Session: 2024-25
Course Title: Mathematics-I
Course Code: FPHL-1335

Course outcomes

After the completion of this course, students should be able to :

CO 1: Give argument related to limits, continuity and derivative of a function and to understand the concept of maxima and minima of a function of a single variable.
CO 2: Explain the significance of Roll's theorem, Mean Value theorem, and Taylor's and Maclaurin's theorem to find the expansions of functions.
CO 3: Demonstrate the geometrical meaning of integral calculus as an area and volume.
CO 4: Introduce the concept of different types of Matrices and to understand the meaning of eigen values and eigen vectors with the process of diagonalization of Matrices.

Master of Science (FYIP) Physics

Semester–I
Session: 2024-25
Course Title: Mathematics-I
Course Code: FPHL-1335

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80

4 0 0 | CA: 20

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries **16 marks.**

UNIT –I

Functions and Derivatives: Limit, continuity and derivative of a function of one variable, geometrical significance of derivative, successive differentiation, Leibnitz theorem, maxima and minima of a function of single variable, partial derivatives, total derivative, chain rule.

UNIT –II

Differential Calculus: Rolle's theorem, mean value theorem, Taylor and Maclaurin formulas, Taylor series; concavity, point of inflexion, asymptotes.

UNIT-III

Anti derivatives: Indefinite integral as an anti derivative, method of substitution, partial fractions, integration by parts; reduction formulae; Definite integrals. Definite integral as a limit of a sum, geometrical interpretation; double and triple integrals.

UNIT-IV

Matrices: Orthogonal matrices, Hermitian matrices, Unitary matrices; Cayley Hamilton theorem and its applications; rank of a matrix, consistency of a system of linear equations, eigen values and eigenvectors, diagonalization of matrices.

Reference Books:

1. Differential Calculus: Shanti Narayan, New Delhi, Shyam Lal,1983.
2. Integral Calculus: Shanti Narayan, Delhi, S. Chand,1968.
3. Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna,1995.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Science (FYIP) Physics

Semester-II

Session- 2024-25

Master of Science (FYIP) Physics (Semester-II)										
Course Code	Course Title	Course Type	Hours per week L-T-P	L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Ext.		CA	
							Th	P		
FPHL-2335	Mathematics-II	C	4-0-0	4-0-0	4	100	80	-	20	3

C-Compulsory

Master of Science (FYIP) Physics

Semester–II
Session: 2024-25
Course Title: Mathematics-II
Course Code: FPHL-2335

Course outcomes

After the completion of this course, students should be able to :

CO 1: Understand the concept of transformation and rotation of axes with the brief introduction of Conic section.

CO 2: Enhance their knowledge in the field of Solid Geometry.

CO 3: Explain the significance and Relation between the roots and co-efficients of polynomial equations and to identify the Solutions of biquadratic polynomial equations by Descartes and Ferrari's methods.

CO 4: Demonstrate the concept of Binary operations, Groups, Subgroups, Group table, Circle Group, Dihedral groups, Cyclic groups, Conjugate elements and Conjugacy classes,

Master of Science (FYIP) Physics

Semester–II
Session: 2024-25
Course Title: Mathematics-II
Course Code: FPHL-2335

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 80
4 0 0 | CA: 20

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries **16 marks.**

UNIT –I

Coordinates Geometry(2D): Transformation of axes, shifting of origin, Rotation of axes, Parabola, Ellipse, Hyperbola and their properties; Tangent and normal, pair of tangents, Chord of contact for alltheconics; Identifications of curves represented by second degree equation (without derivation).

UNIT –II

Solid Geometry: Straight line and planes in Intersection of two and three planes, Intersection of a line and plane; Sphere, Section of a sphere by a plane, Intersection of a line and asphere, Intersection of two spheres; Right circular Cone, Right circular Cylinder, Tangent lines, Tangent planes, and normal lines to these surfaces.

UNIT –III

Polynomial equations: Relation between the roots and co-efficients of polynomial equations (in one variable), Horner's method, Transformation of equations and symmetric functions of roots, Descartes rule of signs, Newton's method of divisors, Cardano's method, Solutions of biquadratic polynomial equations by Descartes and Ferrari's methods.

UNIT –IV

Introduction to Groups: Binary operations, Groups, Subgroups, Group table, SU(2), SU(3), Heisenberg's Group, Circle Group, The Torus Group, Dihedral groups, Cyclic groups, Order of an element of a group, Conjugate elements and Conjugacy classes, Group Homomorphism and Isomorphism, Algebraic property, some standard algebraic properties (without proofs).

Reference Books:

1. S. Narayan, Coordinate Geometry, Sultan Chand &Sons(2005).

2. S. Narayan, Analytical Solid Geometry, Sultan Chand &Sons(2005).

3. B.S. Grewal, Higher Engineering Mathematics: Khanna Publishers, Delhi (1995).

4. Mohan Singh, Topics in Maths, Lakshmi Publication, New Delhi,(1997)

5. N. S. Gopalakrishnan.: University Algebra, New Age International Publishers.(2007)

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Five Years Integrated Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Master of Commerce Under Five Year Integrated Programme(FYIP)

Semester -III

Session- 2024-25

Master of Commerce Under Five Year Integrated Programme(FYIP) Semester -III										
Course Code	Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination time (in Hours)
						Total	Ext.		CA	
							Th	P		
FCOL-3331	Analytical Skills	C	4-0-0	4-0-0	4	100	80	-	20	3

C-Compulsory

Master of Commerce Under Five Year Integrated Programme(FYIP)

Semester -III

Session: 2024-25

Course Title: Analytical Skills

Course Code: FCOL-3331

Course Outcomes

After the successful completion of this course students will be able to

CO 1: Understand the concept of sequence and series, Clock problems, Blood Relationship.

CO 2: Demonstrate procedural fluency with real number arithmetic operations and use these operations to represent real world scenarios and to solve stated problems and Demonstrate number sense and conversion between fractions, decimals and percentages.

CO 3: Use simple and compound interest to do business calculations such as value of money, maturity value, present value, future value and able to differentiate which math method should be used for different problems.

CO 4: Analyse data being presented in the form of tables, Venn diagrams, pie charts.

Master of Commerce Under Five Year Integrated Programme (FYIP)

Semester -III

Session: 2024-25

Course Title: Analytical Skills

Course Code: FCOL-3331

Examination Time: 3 Hours | Max. Marks: 100

L-T-P | Theory: 80

4-0-0 | CA: 20

Instructions for the Paper Setter:

Eight questions of equal marks are to be set, two in each of the four sections (A-D). Questions of sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one from each section. The fifth question may be attempted from any section. Each question will carry 16 marks.

UNIT-I

Data Analysis:- The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a passage is to be analyzed and the questions pertaining to the data are to be answered.

UNIT-II

Sequence and Series:- Analogies of numbers and alphabets completion of blank spaces following the pattern in A:b::C: d relationship odd thing out; Missing number in a sequence or a series.

UNIT-III

Arithmetic ability:- Algebraic operations BODMAS, Fractions, Divisibility rules, LCM&GCD (HCF).

Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

UNIT-IV

Quantitative aptitude:- Averages, Ratio and proportion, Problems on ages, Time, distance, speed.

Business computations: -Percentages, Profit &loss, Partnership, simple and compound interest.

Reference Books:

1. R S Agrawal, Quantitative Aptitude for Competitive Examination, S. Chand and company ltd., New Delhi, 2017
2. R V Praveen, Quantitative Aptitude and Reasoning, PHI Learning private limited, Delhi, Seventh Printing (Second edition) October, 2013

3. A. Guha, Quantitative Aptitude for Competitive Examination, Tata McGraw Hill publications, 6th edition.

Certificate course in Vedic Mathematics.

Session-2024-25

Programme Specific Outcomes

After the successful completion of this Certificate Course, the students will be able to:

PSO 1: Enhance computational skills in Mathematics

PSO 2: Develop Analytical thinking through Vedic Maths.

PSO 3: Enable further research in Indian Ancient Mathematics.

PSO 4: Conduct Seminar on the subject and bringing together scholars in Vedic Mathematics.

PSO 5: Develop postal and online study courses on Vedic Mathematics.

PSO 6: Instil love and remove the fear of Mathematics.

PSO 7: Promote Vedic culture.

PSO 8: Crack entrance of competitive examinations.

Scheme and Curriculum of Examinations

Certificate Course in Vedic Mathematics

Session- 2024-25

Certificate Course in Vedic Mathematics						
Course Code	Course Title	Course Type	Marks			Examination time (in Hours)
			Total	L	P	
CVML-1331	Vedic Arithmetic and Applications	C	50	50	-	3
CVML-1332	Vedic Algebra and Geometry	C	50	50	-	3
Total			100			

C – Compulsory

Duration- 30 Contact hours (1 Year)

Credit :2

Marks :50+50=100

Eligibility : +2 from any stream with 50% marks in aggregate

Method of Delivery :Theory

Examination Pattern : Written Examination

Certificate Course in Vedic Mathematics.

Session-2024-25

Course Title: Vedic Arithmetic and Applications

Course Code: CVML-1331

Course Outcomes

The students will be able to

CO 1: Develop the understanding of objectives and features of Vedic Arithmetic and

recognize the meaning of Mathematical sutras of Vedic Arithmetic in Sanskrit and in English. Also to define Beej-ank, Vinculum using Nikhilam Sutra.

CO 2: Manage to solve the multiplication using Urdhav triyaghbhyam sutra and Ekadhiken Purven Sutra and demonstrate multiplication by 11, 111,1111 by using Vedic sutras of multiplication.

CO 3: Distinguish between squaring numbers ending in 5 and squaring numbers near the base and subbase and manage to perform squaring by Dwandvayoga sutra (General method of squaring) and Cubing by Anurupyen Sutra and to find the square root of perfect square and Cube Roots of perfect cube mentally.

CO 4: To apply division by 9,19,29….., understand the concept of division by using straight division and to enhance the knowledge for Recurring Decimals of fractions 1/13,1/23,5/33,9/11….by Anurupyen Sutra.

Certificate Course in Vedic Mathematics.

Session-2024-25

Course Title: Vedic Arithmetic and Applications

Course Code: CVML-1331

Examination Time: 3 Hours Max. Marks: 50

Instructions for the paper setters/examiners:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

INTRODUCTION: History of Vedic Maths, why Vedic Maths, salient features of Vedic Maths, Introduction to Vedic Maths Sutras- 16 Sutras and 13 Sub Sutras, terms and operations, Beejank, Vinculum Operations, High speed addition by using the concept of completing the whole, introduction to bases and sub bases in Vedic Mathematics, superfast subtraction by Nikhilam Sutra from bases and with any sub base, and its application in subtraction of decimals, Subtraction using Vinculum with Sutras Nikhilam and Eknuyena.

UNIT-II

SUTRAS OF MULTIPLICATION: Multiplication of numbers near to the bases 10,100,1000,10000,using Nikhilam Sutra and multiplication of numbers near sub bases using Nikhilam and Anurupyena, fast multiplication by 11,111,1111 and with multiples of 11, 111 and 1111. Multiplication of numbers consisting of all 9s by Eknuyena and Nikhilam Sutra, Multiplication of Numbers ending with 9, Multiplication by Antyodarshkeyapi Sutra and Antyayoreva, Multiplication by Urdhav triyaghbhyam sutra, (two, three and four digits), Verification by Beejank method, Formation of any Two Digit table.

UNIT-III

SUTRAS OF SQUARES,SQUARE ROOTS,CUBE AND CUBE ROOTS : Meaning of Ekadhiken Sutra and its applications in finding squaring of numbers ending in 5, squaring near base by Yavdunamthavadunikrityavargamchayojyet sutra, squaring near sub base by Anurupyena Sutra, squaring by Dwandvayoga sutra (General method of squaring), Verification by Beejank Method, super fast squaring numbers nearest 50, square roots of perfect squares (upto 6 digits) by Viloknam Sutra, cubes by Anurupyena sutra, Cube of numbers near the base using Nikhilam and general method to find cubes by Anurupyena Sutra, Cube Roots of Perfect Cubes (upto 9 digits). Combined Operations

UNIT-IV

SUTRAS OF FACTORISATION AND DIVISION: Osculation, Divisibility test, Division near the base by Nikhilam Navatascaramam Dasatah Sutra, division near sub base by Paravartya Yojayet, division by

Anurupyena, Division by Dwajank Sutra (Straight division), Conversion of vulgar fractions 1/19,1/29,1/39,1/49…..into decimals by Ekadhiken Purven Sutra, Recurring Decimals of fractions 1/13,1/23,5/33,9/11….by Anurupyen Sutra.

Text Book:

S. B. Tirthaji, Vedic Mathematics, Motilal Banarsidass Private Limited, Revised Edition, 1992 (Scope as in Chapters 2, 3, 4, 5, 10, 26, 27, 28, 31, 32, 33, 34, 35, 36)

Reference Books:

1 K. R. Williams, Vedic Mathematics Teacher's Manual, Inspiration Books, Revised Edition, 2009 (Scope as in Chapters 1, 2, 3, 5, 7, 9, 10, 11)

2 M. Tyra, Magical Book On Quicker Maths, ESC Publications, 5th Edition, 2018 (Scope as in Chapters 2-10, 18, 20, 22, 23, 24, 25)

Certificate course in Vedic Mathematics.

Session-2024-25

Course Title: Vedic Algebra and Geometry

Course Code: CVML-1332

Course Outcomes

The students will be able to

CO 1: Develop the understanding of objectives and features of Vedic Algebra and

recognize the mathematical sutras of Algebra and Geometry in Sanskrit and understand its meaning in English. Manage to solve the Algebraic addition, subtraction multiplication and division using different Sutras.

CO 2: Distinguish between factorization of Quadratic and cubic polynomials using Vedic Sutra and to understand the factorization of Homogeneous equation of second degree by Lopstapanabhyam Sutra.

CO 3: To identify the solution of linear equations with one or two terms of x by Paravartya yojyet Sutra, solution of linear equations in two variables by Paravartya yojyet, Anurupyen sutra and Sankalana-vyavakalana-bhyam quickly

CO 4: Understand and apply Triples (Bodhyan Numbers- BN) in coordinate geometry of two dimension and trigonometry with reference to Bodhyana Sutra

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Session-2024-25

Course Title: Vedic Algebra and Geometry

Course Code: CVML-1332

Examination Time: 3 Hours Max. Marks: 50

Instructions for the paper setters/examiners:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

SUTRAS FOR ALGEBRAIC OPERATIONS: Addition and Subtraction of polynomials, Subtraction of Polynomials, multiplication of polynomials by Urdhvatiragbhyam Sutra: Binomial × Binomial, Trinomial × Trinomial, Trinomial × Binomial, division of polynomials by paravartya yojyet Sutra (Divisor: Linear expression of single variable), Algebraic Squaring.

UNIT-II

SUTRAS OF FACTORIZATION: HCF of two Polynomials by Sakalana-Vyavkalana Sutra, Factorization of Quadratic Polynomials, Factorization of Cubic Expressions by Vilokanam, Factorization of Cubic polynomials by Gunita Sauccaya: Samuccaya Gunita sutra and Lopana-Sthapanabhym. Factorization of Homogeneous equation of second degree by Lopana-Sthapanabhym Sutra.

UNIT-III

SUTRAS FOR ROOTS OF EQUATIONS: Solution of linear equations with one or two terms of x by Paravartya yojyet Sutra, Solution of linear simultaneous equations using Urdhvatiryagbhyam and Sunyam Samya Samuccaye, solution of linear equations in two variables by Paravartya yojyet, Anurupyen sutra and Sankalana-vyavakalana-bhyam, solution of Quadratic equations by Anurupyen Sutra and Adyamadye Nantyamaantyena sutra.

UNIT-IV

SUTRAS FOR GEOMETRY: Introduction to Triples (Bodhyan Numbers- BN), BN of an angle, multiplication of a constant in a BN, BN of complementary angles, BN addition of angles, BN of double angle, BN of quadrant angles, Application of BN: BN subtraction of angles, BN Geometry, Angle between two lines, Half Angle, Coordinate Geometry (two dimension): Length of

perpendicular from a point onto a line, Equation of a straight line through two given points by Urdhavtriagbhyam Sutra, BN Trigonometry, Bodhayan Sutra as Pythagoras theorem.

Text Book:

S. B. Tirthaji, Vedic Mathematics, Motilal Banarsidass Private Limited, Revised Edition, 1992 (Scope as in Chapters 3, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 37)

Reference Books:

1 K. R. Williams, Vedic Mathematics Teacher's Manual, Inspiration Books, Revised Edition, 2009 (Scope as in Chapters 4, 5(5.3), 6, 7(7.2), 8, 10(10.7))