SOLAPUR UNIVERSITY, SOLAPUR

SYLLABUS

FOR

M.Sc. (Part-II) MATHEMATICS
(Semester III and IV)
Credit System

WITH EFFECT FROM ACADEMIC YEAR 2015-16

(JUNE-2015).

SOLAPUR UNIVERSITY, SOLAPUR

SCHOOL OF COMPUTATIONAL SCIENCES

DEPARTMENT OF MATHEMATICS

Revised Syllabi of M.Sc. in Mathematics (Credit System)

1) **Title of the course:** M.Sc. in Mathematics
2) **Pattern:** Semester and Credit system.
3) **Duration of Course**: 2 years
4) **Strength of the Students:** 40
5) **Eligibility:** For M. Sc. in Mathematics following candidates are eligible.
   (i) B.Sc. with Mathematics as principal level.
   (ii) B.Sc. with any subject as principal and Mathematics at subsidiary level.

M. Sc. program in Mathematics consists of 100 credits. Credits of a course are specified against the title of the course.

A Four Semester M.Sc. Mathematics Course

Semester	No. of Papers/ Practical's / Seminar	Marks	Credits
Semester I			
• Theory Papers	05	500	20
• Practical Paper	01	100	04
• Seminar/Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Semester II			
• Theory Papers	05	500	20
• Practical Paper	01	100	04
• Seminar/ Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Semester III			
• Theory papers	05	500	20
• Practical Paper	01	100	04
• Seminar/ Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Semester IV			
• Theory papers	05	500	20
• Practical Paper	01	100	04
• Seminar/ Tutorial/Home Assignment /Field Tour/ Industrial Visit	01	25	01
Total marks and credits for M.Sc. Course		**2500**	**100**

M.Sc. Part-II (Mathematics) revised syllabus (according to the Semester Pattern Examination and Credit System) to be effective from the Academic Year 2015-16

Notations: A five – character code is given to each paper. In that "MM" stands for Master of Mathematics. The first digit following 'MM' is semester number. The second digit "0" stands for the compulsory paper, the digit "1" stands for the elective paper and the digit "2" stands for the practical paper. The third digit indicates the serial number of the paper in that semester.

.M.Sc.-II Mathematics Semester-III

Paper Code	Paper No.	Title of the Paper	Contact hours /week	Distribution of Marks for Examination			Credits
				Internal	External	Total	
MM-301	XI	Functional Analysis	04	30	70	100	04
MM-302	XII	Advanced Discrete Mathematics	04	30	70	100	04
---	XIII	Elective- I	04	30	70	100	04
---	XIV	Elective- II	04	30	70	100	04
---	XV	Elective – III	04	30	70	100	04
MM-326	---	Practical – III (Batch wise)	12	30	70	100	04
Seminar			02	25	--	25	01
Total			**34**	**205**	**420**	**625**	**25**

Elective Papers from which <u>Any Three</u> are to be chosen

MM-311: Linear Algebra

MM-312: Modeling and Simulation

MM-313: Numerical Analysis

MM-314: Differential Geometry

MM-315: Fuzzy Mathematics

MM-316: Commutative Algebra – I

M.Sc. II Mathematics Semester-IV

Paper Code	Paper No.	Title of the Paper	Contact hours /week	Distribution of Marks for Examination			Credits
				Internal	External	Total	
MM-401	XVI	Measure and Integration	04	30	70	100	04
MM-402	XVII	Partial Differential Equations	04	30	70	100	04
---	XVIII	Elective- I	04	30	70	100	04
---	XIX	Elective- II	04	30	70	100	04
---	XX	Elective – III	04	30	70	100	04
MM-426	---	Practical – IV (Batch wise) and Project	12	30	70	100	04
Seminar			02	25	--	25	01
Total			**34**	**205**	**420**	**625**	**25**

Elective Papers from which <u>Any Three</u> are to be chosen

MM-411: Integral Equations

MM-412: Operations Research

MM-413: Probability Theory

MM-414: Combinatory

MM-415: Number Theory

MM-416: Commutative Algebra - II

<u>Note:</u> Syllabus for some Elective courses has been given. Depending on need and demand, syllabus for other elective courses listed or of new elective courses will be submitted for approval.

<u>Evaluation Scheme:</u>

Each theory and practical paper will have 100 marks out of which 70 marks will be for Term End examination and 30 marks for Internal Assessment. The candidate has to appear for internal evaluation of 30 marks and external evaluation (University Examination) of 70 marks for each paper/ practical.

<u>Internal Evaluation:</u>

- In case of theory papers internal examinations will be conducted by school.

- In case of practical paper 10 marks shall be for day-to-day journal and internal examination 20 mark will be conducted by the school.

External Evaluation (End of Term University Examination):

I) Nature of Theory question paper:

1) Each theory paper will be of 3 hours duration
2) There shall be 7 questions each carrying 14 marks.
3) Students have to attempt **five questions**.
4) Question No.1 is **compulsory** and shall contain 14 objective type sub-questions each carrying 1 mark.
5) Question No.2 is **compulsory** and shall contain 4 short answer / short note type sub-questions each carrying 3 or 4 marks.
6) Students have to attempt **any three** questions from Question N0. 3 to Question No. 7.
7) Question N0. 3 to Question No. 7 shall contain 2 long answer type sub-questions.

II) Nature of Practical question paper: (End of Term Examination)

For Sem-III: Practical examination will be conducted for 60 marks and is of 3 hours duration. There shall be 6 questions each of 15 marks, of which student has to attempt any 4 questions. VIVA will be for 10 marks.

For Sem-IV: i) Practical examination will be conducted for 40 marks and is of two hours duration. There shall be 3 questions each of 20 marks, of which a student has to attempt any 2 questions.

ii) Project work carries 30 marks. Project work consists of collecting information relative to project topic. Out of 30 marks, 10 marks are reserved for VIVA.

Equivalence for Theory Papers:

Semester No.	Old Syllabus		Revised Syllabus	
	Paper Code	**Title of the Paper**	**Paper Code**	**Title of the Paper**
III	MM-301	Functional Analysis	MM-301	Functional Analysis
	MM-302	Advanced Discrete Mathematics	MM-302	Advanced Discrete Mathematics
	MM-303	Operation Research-I	Elective-III	
	MM-304	Linear Algebra	Elective-I	
	MM-305	Integral Equations	Elective-II	
IV	MM-401	Measure and Integration	MM-401	Measure and Integration
	MM-402	Partial Differential Equations	MM-402	Partial Differential Equations
	MM-403	Numerical Analysis	Elective-I	
	MM-404	Operation Research-II	Elective-II	
	MM-405	Boundary Value Problems	Elective-III	

Paper No. XI

Paper Code: MM-301

FUNCTIONAL ANALYSIS

Unit - 1

Banach spaces :

Normed linear spaces,Banach spaces, Quotient norm spaces, continuous linear transformations, equivalent norms,the Hahn-Banach theorem and its consequences. Conjugate space and separability, second conjugate space. The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle.

(25 L)

Unit - 2

Hilbert spaces :

Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Perseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of on operators, self adjoint operators, Normal and unitory operators, projections. **(20 L)**

Unit - 3

Contraction mapping and Banach fixed point theorem.

(5 L)

Recommended Books :

1. G.F.Simmons **:** Topology and Modern Analysis, McGraw Hill (1963)

Reference Books :

1. G.Bochman and Narici **:** Functional Analysis, Academic Press 1964
2. A.E.Taylor **:** Introduction to Functional analysis, John Wiley- and sons (1958)
3. A.L.Brown and Page **:** Elements of Functional Analysis, Van-Nastra Reinehold com (1970)
4. B.V.Limaye **:** Functioned Analysis New age international.
5. Erwie Krey Zig **:** Introduction to Functional Analysis with Applications, John Wiley and Sons.
6. D. Somsundaram : A First Course in Fuctional Analysis, Narosa Publishing House

Paper No. XII

Paper Code: MM-302

ADVANCED DISCRETE MATHEMATICS

Unit - 1

Lattices**:** Definition and examples of posets and lattices, sublattices and direct products, Modular and distributive lattices, Homomorphisms, Boolean algebras and applications.

(15 L)

Unit - 2

Graph Theory:

Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, paths and cycles in a graph, connected graphs, The matrix representation of a graph, Fusion.

(15 L)

Unit - 3

Trees: Definition and simple properties of a tree, bridges, spanning trees, cut vertices.

(10 L)

Unit - 4

Combinotories : Basic counting methods**:** Inclusion exclusion principle Pigeonhole principle, recurrence relations and generating functions.

(10 L)

Recommended Books :

1. Gorrett Birkhaff and T.C.Bartee,Modern Applied Algebra, CBS Pub. and Distributors.
2. John Clark and Derek Holton A first book at Graph Theory Applied Publishers Ltd.
3. Rich and Brualdi **:** Combinatories
4. C.T.Liu **:** Discrete Mathematics.
5. John C. Martin : Introduction to languages and the theory of computation Tata McGraw Hill Publishing Co, Ltd, New Delhi

Reference Books:

1. Rudolf Lidl and Gunter Pils : Applied Abstract Algebra, Springer Verlag.
2. J.E. Hopcroft and Jeffery D. Ullman. Introduction to Automata theory, languages and computation Narosa publishing House, 1993
3. K.L.P.Mishra and M Chandrasekaran Theory of Computer Science, Prentice Hall of India Ltd.

Elective Paper
Paper Code: MM-311

LINEAR ALGEBRA

Unit – 1: Linear Transformations

Linear functional, The double dual, The transpose of a linear transformation, characteristic values, Annihilator polynomials, invariant subspaces.

(15 L)

Unit – 2: Elementary canonical forms:

Triangulabity, diagonalizabitlity, Direct sum decompositions, Invariant direct sums, The primary decomposition theorem.

(10 L)

Unit – 3: Rational and Jordan Forms:

The rational form, the Jordan form, computation of Invariant factors.

(15 L)

Unit – 4

Inner Product Spaces:

Linear functional and ad joints, unitary operators, Normal operators,

Operators on Inner Product Spaces:

Forms on Inner product spaces, positive forms, more on forms, spectral theory

(5 L)

(5 L)

Recommended Books :

1. K.Hoffman and Ray Kunze : Linear Algebra, Prentice Hall of India,Pvt Ltd. 1989.
2. Vivek Sahai, Vikas Bist : Linear Algebra, Alpha Science International

Reference Books :

1. David M.Barton **:** Abstract and linear Algebra, Addison Wesley Publishing Co.
2. Sharma, Vasistha & vasistha: Linear Algebra, Krishna prakashan ltd. Meerut. 2005.
3. Friedberg H. Stephen, Insel J. Arnold, Spence E. Lawrence , Eastern Economy Edition

Elective Paper

Paper Code: MM-312

MODELING AND SIMULATION

Unit-1. Stochastic Models: Introduction, Discrete distributions (Bernoulli, Binomial, Poisson, Geometric, Hypergeometric, Uniform), Continuous distributions (Uniform, Exponential, Gamma, Normal), Poisson Process, Markov chains and applications. **(6 L)**

Unit-2. Inventory Models: Introduction, Types of Inventories, Reasons for carrying inventory, Objectives of scientific Inventory Control, Concept of EOQ (Deterministic Model). **(8 L)**

Unit-3. Queuing Models: Introduction, Queuing System, Elements of queuing system, birth and death process model, Queuing Models M/ M/1, M/M/C. **(8 L)**

Unit-4. Network Analysis: Applications of PERT and CPM techniques, Network diagram representation,Rules for constructing the network diagram, Determination of critical path. **(8 L)**

Unit-5. Simulation: Introduction, Uses of simulation, Steps in simulation study, Advantages and disadvantages of simulation, Simulation models- continuous and discrete simulations. **(4 L)**

Unit-6. Random Number Generation : Introduction, Types of random numbers, Pseudo random number generator, Tests for random numbers, Techniques for generating random numbers, Inverse transformation technique, Generating random variates from Uniform, Bernoulli, Binomial, Exponential and Normal distributions. **(8 L)**

Unit-7. Simulation Models: (Flow chart and/or algorithms): Monte-Carlo simulation, Simulation of inventory problem, Simulation of queuing system, Fixed time step versus event to event model, Simulation of PERT problems. **(8 L)**

Reference Books:

1) Allen Arnold o.(1978). Probability, Statistics and Queuing with Computer Science Applications, Academic Press.
2) Kishore Trivedi. (1982). Probability and Statistics with Reliability, Queuing with computer science Applications, Prentice Hall.
3) Geofrey Gordon (1999). System Simulation, PHI, Second ed.
4) Narsingh Deo (1979). System Simulation with Digital Computer, PHI.
5) Fred Maryanski (1987). Digital Computer, Simulation, CBSPD.
6) Jerry Banks, John Carson, B. L. Nelson (1998). Discrete-Event Simulation. PHI, 2nd ed.
7) Taylor and Karlin, Stochastic Modeling, Academic Press.
8) Sharma J. K. (2003): Operations Research Theory and Applications, 2nd Ed. Macmillan
9) Sharma S.D. Operations Research,
10) J. Mehdi,(1982), Stochastic Process, Wiley

Elective Paper

Paper Code: MM-313

NUMERICAL ANALYSIS

Unit – 1 **(15 L)**

Errors in numerical calculations and solution of algebraic and transcendental equations.

1.1 Numbers and their accuracy

1.2 Mathematical preliminaries.

1.3 Errors & their computation: Absolute, relative & percentage errors.

1.4 A general error formula

1.5 Error in series approximation

1.6 The iteration method & it's rate of convergence.

1.7 The method of false position & its rate of convergence

1.8 Secant method & its rate of convergence.

1.9 Newton Raphson method and its rate of convergence.

Unit – 2 :

Interppolation and Numerical Differentiation. **(15 L)**

2.1 Errors in polynomial interpolation.

2.2 Finite Differences: Forward, Backward & Central Differences, Symbolic relations & separation of symbols.

2.3 Newton's Formula for interpolation.

2.4 Lagrange's interpolation formula and error in Lagrange's interpolation formuls.

2.5 Divided differences & their properties.

2.6 Newton's general interpolation formula.

Unit – 3 : **(10 L)**

Numerical solutions of system of linear equations & Eigen Values.

3.1 Gaussian elimination method.

3.2 Method of factorization (LU decomposition)

3.3 Iterative Method: Gauss Seidal Method.

3.4 Eigen value problem: Householder's method.

3.5 Eigen value of symmetric tridiagonal matrix.

3.6 Power method for largest Eigen value.

Unit – 4 : **(10 L)**

Numerical Intergration and Solutions of ordinary differential equations

4.1 Numerical Integration: Trpezoidal rule Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

4.2 Errors in the above methods.

4.3 Solution of differential equation by Taylor's series: Euler's method and Euler's modified method.

Recommended Books :

1) S. S. Sastry Introductory Methods of Numerical Analysis, 3^{rd} edition, Prentice Hall of India, 2001
2) M. K. Jain, S. R. K. Iyengar, S. R. Iyenger, R. K. Jain, Numerical Methods for scientific and Engineering computation, 3^{rd} edition, wiley Eastern Ltd., 1992

Reference Books :

1) Atkinson K. E., An Introduction to Numerical Analysis, John Wiley and Sons, N. Y., 1978.
2) Froberg C. E., Introduction to Numerical Analysis, Johns Hopkins University Press, Baltimore, 1950.

Paper Code: MM – 326

PRACTICAL – III

Unit – 1 : Functional Analysis

1) Problems on Banach Spaces
2) Problems on Hilberts spaces
3) Problems on Conjugate Spaces
4) Problems on Contraction Mapping

Unit – 2 : Advanced Discrete Mathematics

1) Problems on Lattices
2) Problems on Graph Theory
3) Problems on Trees
4) Problems on Combinatories

Unit – 3 : Elective-I

At least four practicals on **Elective -I** Paper be conducted.

Unit – 4 : Elective-II

At least four practicals on **Elective-II** Paper be conducted.

Unit – 5 : Elective-III

At least four practicals on **Elective-III** Paper be conducted.

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PAPER No. XVI

Paper Code: MM 401

MEASURE AND INTEGRATION.

Unit - 1

Measure and Integration **:** Measure space, Measurable function, Integration Fatous lemma, Generalization of monotone and Lebesque convergence theorem.

(15 L)

Unit - 2

Signed Measure **:** Hahn Decomposition, Jordan Decomposition, Radon-Nikodyn theorem Lebesque Decomposition.

(15 L)

Unit - 3

Measure and Outer Measure :

Outer Measure and measurablebility, the Extension theorem, Product measures Fubini and Tonelli theorem.

(10 L)

Unit - 4

Inner measure and its properties. Baire Borel sets and positive linear functional and Borel measures.

(10 L)

Recommend Books:

1.Royden H.L:Real Analysis (Third Edition Prctice Hall (2002).

Reference Books :

1. Berberian, S.K. **:** Measure and Intergration McMillan, N.Y. 1965
2. Friedman A. **:** Foundations of Modern Analysis, Helf Rinehart and Winston, 1970
3. Wheeden R.L. and Zygmund A. **:** Measure and integral, Marcel Dakker, 1977
4. Halmos, P.R. : Measure Theory **:** Van Nostrand 1950
5. A Murkherjee and K.Pethoven : Real and Functional Analysis, Plenum Press 1978.
6. Rana J.K. **:** Measure and integration Narosa (1997)

PAPER No. XVII

Paper Code: MM 402

PARTIAL DIFFERENTIAL EQUATIONS

Unit – 1 **(25 L)**

First order Partial Differential Equations

Curves and surfaces, classification, linear equations of first order. Ptaffians, compatible systems, Charpits method Jacobi method. Integral surfaces through a given curve, quasi linear equations, nonlinear first order pdes.

Unit - 2

Second order Partial Differential Equations **(25 L)**

Classification,one dimenswional wave equations, vibrations, of a string,maximum and minimum principles,Dirichlets and Neumann problems. Dirichlet problem forcircle. Classification in case of a variables. Harnacks theorem. Greens theorem. families to equipotential surfaces. St only.

Recommended Books :

T. Amarnath: An elementary course in Partial differential equations, Narosa publication, 1987.

Reference Books:

1. Frite John **:** Partial Differential Equations.
2. R.McOwen **:** Partial differential equations, Prentice Hall 1995
3. G.Folland : Partial Differential Equations Prentice Hall India 1995

Elective Paper

Paper Code: MM 411

INTEGRAL EQUATIONS

Unit - 1

Preliminary concepts **:** Introduction, Some problems which give rise to integral equations, Classification of linear integral equations, Integro -differential equations, conversions of initial value problems to Volterra type integral equations and boundary value problems Fredholm type integral equations, Conversion of Sturm Liouville problems to integral equations.

(18 L)

Unit - 2

Fredholm Equations **:** Integral equations with separable (Degenerate), Hermitian and symmetric Kernel, The operator method in the theory of integral equations, Hilbert-Schmidt theorem. Construction of Green function and its use in solving Boundary Value Problems

(18 L)

Unit - 3

Volterra Equations **:** Types of Volterra equations, Resolvent kernel of Volterra equations, Methods of successive approximations Convolution type kernels. Aplication of Fourier and Laplace transforms to the solution of Volterra integral equations.

(14 L)

Recommended Books :

1. Kanwal, R.P**. :** Linear Integral Equations, Theory and Techniques, Academic Press (1971)
2. Chambers, L.G**. :** Integral Equations : A Short Course, International Text Book Co., (1976)

Reference Books :

1. C.D.Green **:** Integral Equation Methods, Thomas Nelson and Sons (1969)
2. J.A. Cochran **:** The Analysis of linear Integral Equations, Mc-Graw Hill (1972)
3. Krasnow M.A.: Kislov and G. Hakaronke : Problems and exerciscs in integral equations Mir Publications (1971)

4. Shanti Swarup: Integral Equations, Krishna Prakashan Media (P) Ltd., Meerut

Elective Paper

Paper Code: MM 412

OPERATIONS RESEARCH

Unit-1. Convex Sets and Functions: Convex sets, supporting and separating hyperplanes, convex polyhedra and polytope, extreme points, convex functions. **(5 L)**

Unit-2. Linear Programming Problem (LPP): Introduction to linear programming problems, Graphical solution to LPP, Standard LPP (SLPP), basic solution and basic feasible solution to SLPP. Methods for solving LPP: Simplex Algorithm, Two-phase simplex method, Big M method . **(15 L)**

Unit-3. Duality in LPP: Concept of duality, Theorems related to duality, complementary slackness property and development of dual simplex algorithm. **(5 L)**

Unit-4. Integer Linear Programming Problem (ILPP): The concept of cutting plane, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method (Algorithm only). **(9 L)**

Unit-5. Quadratic Programming Problem (QPP): Definition of QPP, Kuhn-Tucker conditions, Algorithms for solving QPP: Wolfe's and Beale's algorithm. **(8 L)**

Unit-6. Theory of Games: Two person zero sum games, Minimax and Maxmin principles, Saddle point, Mixed strategies; Rules of dominance, Solution of 2 x 2 game by Algebraic method, Graphical method, Reduction of game problem as LPP, Minimax and Maxmin theorem (without proof). **(8 L)**

Recommended Books :

1)Sharma S.D : Operations Research, Macmillan Publishers India Ltd.

Reference Books:

1) Hadley G. (1969): Linear Programming, Addision Wesley.
2) Taha H. A. (1971): Operations Research an Introduction, Macmillan N. Y.
3) Kanti Swaroop, Gupta and Manmohan (1985): Operations Research, Sultan Chand & Co.
4) Sharma J. K. (2003): Operations Research Theory and Applications, 2nd Ed. Macmillan India ltd.
5) Sharma J. K. (1986): Mathematical Models Operations Research, Macgraw Hill.

Elective Paper

Paper Code: MM 413

PROBABILITY THEORY

Unit-1: Classes of sets, Sequence of sets, limsup and limijf and limit of sequence of sets, field, σ-field, σ- field generated by a class, Borel σ-field. **(6 L)**

Unit-2: Probability measure, Probability space, properties of probability measure-continuity, mixture of probability measure. Lebesgue and Lebesgue-Steltjes measures on R. Independence of events. **(6 L)**

Unit-3: Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable, liminf, limsup and limit of sequence of random variables. Method of obtaining a random variable as a limit of sequence of simple random variables. **(10 L)**

Unit-4: Integration of a measurable function with respect to a measure, expectation of a random variable, monotone convergence theorem, Fatous Lemma, Dominated Convergence theorem and their application. **(6 L)**

Unit-5: Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability, uniqueness of limit, a characterizing property. Yule Slutsky results and preservation under continuous transform (statement only). convergence in r^{th} mean, interrelationships. **(10 L)**

Unit-6: Independence: Borel-Cantelli Lemma, Characteristics function, simple properties. Inversion theorem and uniqueness property (statements only). **(6 L)**

Unit-7: Convergence in distribution, continuity theorem (statement only), Weak and Strong laws of large numbers, Kolmogorov's three series theorem for almost sure convergence (statement only), Liaponove's Lindeberg-Feller Theorems on CLT (statement only). Application of the above result. **(6 L)**

Reference Books:

1. Bhat B. R. (1999): Modern Probability Theory (3^{rd} ed.).New Age International (P) Ltd..
2. Billingsley P.(1986): Probability and Measure-.John Wiley and Sons.
3. Alan Karr (1993): Probability Theory-Springer Verlag.
4. Kingman, J F C and Taylor, S.J.(1966): Introduction to Measure and Probability- Cambridge University Press.
5. Dudly, R.M.(1989): Real Analysis and Probability- Wadsworth and Brooks/ Cole.
6. Ash Robert (1972): Real Analysis and Probability-Academic Press.

Paper Code: MM – 426

PRACTICAL – IV

Unit – 1 : Measure and Integration

1) Problems on Measure Integration and signed Measure
2) Problems on Measure , Outer Measure and Inner Measure

Unit – 2 Partial Differential Equation

1) Problems on first order partial differential equations
2) Problems on second order Partial Differential Equations

Unit – 3 : Elective-I

At least two practicals on **Elective -I** Paper be conducted.

Unit – 4 : Elective-II

At least two practicals on **Elective-II** Paper be conducted.

Unit – 5 : Elective-III

At least two practicals on **Elective-III** Paper be conducted.

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