

SAURASHTRA UNIVERSITY RAJKOT

MATHEMATICS

Syllabus of B.Sc. Semester-5 & 6

According to Choice Based Credit System

Effective from June – 2018

*(Updated on date:- 26-07-2017
and updation implemented from June - 2018)*

Syllabus of B.Sc. Semester-6
According to Choice Based Credit System
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*(Updated on date:- 26-07-2017
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- **Program:** **B.Sc.**
- **Semester:** **6**
- **Subject:** **Mathematics**
- **Course codes:**
 - 08 (A) -Theory**
 - 09 (A) -Theory**
 - 10 (A) -Theory**
 - 08 (B) - Practical**
 - 09 (B) - Practical**
 - 10 (B) - Practical**
 - 1 Project**
- **Total Credit Of The Semester** **24 Credit**

B. Sc. MATHEMATICS SEMESTER : VI

- The Course Design of B. Sc. Sem.- VI (Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Name, No. of theory lectures per week, No. of practical lectures per week, total marks of the course are as follows :

SR.NO	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER WEEK	TOTAL MARKS	Credit Of Each Paper.
1	PAPER 08 (A) (Theory) Graph Theory & Complex Analysis-II	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	PAPER 09 (A) (Theory) Mathematical Analysis-II & Abstract Algebra-II	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	PAPER 10 (A) (Theory) Optimization & Numerical Analysis-II	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	PAPER 08 (B) (Practical) Introduction to GeoGebra	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	PAPER 09 (B) (Practical) Numerical Analysis-II	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	PAPER 10 (B) (Practical) Optimization	-	6	35(External)+ 15(Internal) = 50 Marks	3
7	Project Work & Viva	1 Guidance Lect. For a group of 2 to 5 students / week	Project work to be finalized and certified and evaluated.	60Marks (Dissertation) + 40 Marks (Viva) = 100 Marks	3
Total credit of the semester five					24

**Marks Distribution of Each Paper
for
Theory and Practical (for SEMESTER-VI)**

- **Total Marks of Each Theory Paper [External Examination]** **70 Marks**
- **Total Marks of Each Theory Paper [Internal Examination]** **10 Marks Assignments +
10 Marks QUIZ / test +
10 Marks Internal exam. =
30 Total Marks**
- **Total Marks of Each Practical Paper [External Examination]** **35 Marks**
- **Total Marks of Each Practical Paper [Internal Examination]** **15 Marks
[Continuous internal assessment of
practical work]**

Format of Question Paper

- There shall be one question paper of **70 marks & $2\frac{1}{2}$ hours** for each Mathematics Theory Paper.
- There shall be FIVE questions from each unit of 14 marks each.
- Each Question will be of the following form.

Question	(A) Answer any four out of four (Short answer type question)	4 Marks
	(B) Answer any one out of two	2 Marks
	(C) Answer any one out of two	3 Marks
	(D) Answer any one out of two	5 Marks
TOTAL		14 MARKS

B.Sc. Mathematics

SEMESTER - 6

MATHEMATICS PAPER – 08 (A) (Theory)

GRAPH THEORY and COMPLEX ANALYSIS - II

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UNIT 1: [14 Marks]

Graph theory:

Basic definitions and simple examples, Directed, Undirected, multi-graph, mixed graph. Incidence relation and degree of the graph. Empty, complete, regular graphs. Sub graph, connected and disconnected graphs.

Walk and unilateral components, Euler graphs, Unicursal graph, Operation of graph circuit & tree. Hamiltonian path and cycles, tree, Binary and Spanning trees.

UNIT 2: [14 Marks]

Cut-set, connectivity and separability

[OMIT:-1-isomorphism, 2-isomorphism]

planner graphs and their different representation, Dual of a planner graph, Euler's formula, Kuratowski's first and second non-planner graph, vector space associated with a graph, Circuit subspace and cut sets subspace, Orthogonal space.

Vertex coloring, Chromatic number, Index number and partition, Cyclic graph and demyelization of cyclic graphs, Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix,

[OMIT :- Circuit matrix, Fundamental circuit matrix and cut set matrix, Relation ship of these matrices]

Rank of the adjacency matrix.

UNIT 3: [14 Marks]

Mapping and Conformal mapping:

Elementary functions, mapping by elementary functions, Mobious mapping, linear function, Bilinear mapping $w=(az+b)/(cz+d)$, $w = z^2$, $w = 1/z$, $w = \exp(z)$,

[OMIT: $w = \sin z$, $w = \cos z$, $w = \cosh z$, $w = \sinh z$]

Transformations, Conformal mappings and their examples.

UNIT 4: [14 Marks]

Power series:

Definition of complex sequence, Complex series and power series Expansion of a complex function in Taylor's series and Laurent's series.

UNIT 5: [14 Marks]

Residues and poles:

Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue's theorem, Evaluation of improper real integrals by residue theorem and evolution of definite integral of trigonometric functions by residue theorem.

Text book for Mathematics PAPER – 08 (Unit 1 & 2)

Graph theory

Graph theory with application to engineering and computer science

By: - Narsingh Deo,

Prentice Hall of India Private Limited, New Delhi.

Chapter: 1

- § 1.1, § 1.3, § 1.4, § 1.5
- [OMIT : - § 1.2 and § 1.6]

Chapter: 2

- § 2.1, § 2.2, § 2.3, § 2.4, § 2.5, § 2.6, § 2.7, § 2.8, § 2.9
- [OMIT: - § 2.10]

Chapter: 3

- § 3.1, § 3.2, § 3.3, § 3.5, § 3.6, § 3.7, § 3.8
- [OMIT: - § 3.4, § 3.9, § 3.10]

Chapter: 4

- § 4.1, § 4.2, § 4.3, § 4.4, § 4.5,
- [OMIT: - § 4.6, § 4.7, § 4.8]

Chapter: 5

- § 5.2, § 5.3, § 5.4, § 5.5, § 5.6
- [OMIT: - § 5.1, § 5.7, § 5.8, § 5.9]

Chapter: 6

- § 6.1, § 6.5, § 6.7, § 6.9
- [OMIT: - § 6.2, § 6.3, § 6.4, § 6.8]

Chapter: 7

- § 7.1, § 7.8, § 7.9
- [OMIT: - § 7.2, § 7.3, § 7.4, § 7.5, § 7.6, § 7.7]

Chapter: 8

- § 8.1, § 8.2, § 8.5
- [OMIT: - § 8.3, § 8.4, § 8.6]

Chapter: 9

- § 9.1, § 9.11
- [OMIT: - § 9.2 to § 9.10]

Text Book of Mathematics Paper 08 Unit 3, 4 & 5 is as follows

**“Complex Variables and Applications”
Fifth Edition,
Ruel V. Churchill and James Ward Brown.
Mc Graw – Hill Publishing Company**

Chapter 5

- Sections 44, 45, 46, 47, 48 [Omit Sections: -49, 50, 51],

Chapter 6

- Sections 53 to 58, 60 [OMIT:- Sections 59]

Chapter 7

- Sections 64, 65, 66, 67, 68, 70
[OMIT Sections: - 63, 71, 72]
[OMIT: - Chapter 8]

References

- (1) Complex variables and applications, by R. V. Churchill and J. \ Brown
- (2) Theory of functions of a Complex variables, by Shantinayakan, Chand & Co.
- (3) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas,

Cambridge University Press.

(4) Graph theory with application to engineering and computer science.by Narsingh Deo.
1993,Prentice Hall of India Pvt. Ltd.

(5) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd.
Publishers.

(6) A first look at Graph theory, by Clark.

(7) Discrete Mathematical Structures with applications to computer science,
by Trembley I.P. and Manohar R.

(8) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me.
GrawHill, International edition, Computer Science series, 1986.

(9) Discrete Mathematics, By Vatsa, Vikas Publications.

(10) Introduction Graph Theory, By R. J. Willsons

(11) Discrete Mathematics Structure, By. Dugragi, N

B.Sc. Mathematics

SEMESTER - 6

MATHEMATICS PAPER – 09 (A) (Theory)

MATHEMATICAL ANALYSIS - II and ABSTRACT ALGEBRA - II

UNIT 1: [14 Marks]

Compactness in Metric Spaces

Cover, Open cover, Finite sub cover, Compact set, Properties of compact sets
Connected sets, Separated sets, Bolzano-Weirstrass theorem, Countable set.

Homeomorphism of two metrics, Sequential compactness, totally bounded space.

UNIT 2: [14 Marks]

Laplace Transforms

Definition of Laplace Transforms, Laplace Transforms of elementary Function
Inverse Laplace Transforms, Laplace Transforms of Derivative

UNIT 3: [14 Marks]

Application of Laplace Transforms to Differential Equations.

Laplace Transforms of Integrals, Laplace Transforms Differentiation and integration of Laplace Transforms, Convolution theorem, Application to Differential Equations.

UNIT 4: [14 Marks]

First fundamental theorem of homomorphism of groups and Rings

Homomorphism of groups, Kernel of homomorphism, First fundamental theorem of homomorphism of groups. Ring and its properties, Subring, [OMIT:- **Boolean ring, Euclidean ring**]

Field, Zero divisor, Integral domain, Characteristics of ring, Cancellation law, Ideals, Principal ideal, Polynomial ring, [OMIT:- **Quotient ring. Maximal ideal**] Polynomial, Degree of polynomial, Factor and remainder theorem of polynomial, Product, sum and division of polynomials.

UNIT 5: [14 Marks]

Polynomial Rings

Reducible and irreducible polynomials, Factorization of polynomials(unique Factorization theorem (**without proof**), [OMIT:- **Eisenstein's criterion**]

Division algorithm theorem of polynomial

G.C.D. of polynomials, Quaternion [OMIT:- **Ring homomorphism, Euler and Fermat's theorem**]

Text book for Mathematics PAPER – 09 (A)

MATHEMATICAL ANALYSIS - II (Unit 2 and 3)

For Laplace Transforms

‘Advanced Mathematics for Pharmacy’

By: - Dr. M. M. Patel, Atul Prakashan, Ahmedabad

Chapter: - 17 Laplace Transforms

§ 16.1 to 16.9 , § 16.11, § 16.12 [OMIT :- § 16.10]

Text Book for MATHEMATICS PAPER 09 (A)

“Abstract Algebra” By: Dr. I. H. Sheth, Prentice Hall Of India, New Delhi.

Course of Mathematics PAPER – 09 (A) (Unit 4 & 5) are covered by following Chapters/
Sections of the above mentioned book Abstract Algebra

Chapter 12: § 12.1, § 12.2, § 12.6

Chapter 13: § 13.1, § 13.2, § 13.3, § 13.4

Chapter 14: § 14.1, § 14.2, § 14.3, § 14.4

Chapter 15: § 15.1, § 15.2, § 15.4 [OMIT:- § 15.3]

Chapter 18: § 18.1, § 18.2, § 18.3,

§ 18.4 [Omit: Theorem: 18.4.8

i. e. unique Factorization theorem (without proof),

§ 18.5[OMIT: - § 18.6 - Eisenstein's criterion]

§ 18.7.

References :

(1) Topics in Algebra, I. N. Herstein, Willey Eastern Ltd. New Delhi

(2) A text Book of Modern Abstract Algebra, by Shantinayakan, S. Chand & Co., New Delhi.

(3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson

and M. K. Sen, McGraw Hill International Edition - 1997

(4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.

(5) Abstract Algebra, By Bhattacharya, Yallo Publications.

(6) Modern Algera, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.

(7) Text Book: Abstract Algebra, Dr. I. H. Sheth, Nirav Prakashan, Ahmedabad.

(8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'

(9) Mathematical Analysis, by T. M. Apostol

(10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)

(11) A course of Mathematical Analysis, by Shantinayakan, S. Chand & Sons.

(12) Metric space, by E. T. Capson

(13) Metric space, P. K. Jain & Ahmad, Narora Publishing House

(14) Real Analysis by Sharma and Vasishta Krishna Prakashan, Meerut-2.

(15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

B.Sc. Mathematics
SEMESTER - 6
MATHEMATICS PAPER – 10 (A) (Theory)
OPTIMIZATION and NUMERICAL ANALYSIS - II

UNIT 1:

[14 Marks]

Linear Programming Problems

The linear programming problems, Formulation of LPP, Matrix form of the LPP, general form, Canonical form, Standard form of the LPP, Graphical method to solve LPP, Some definitions and basic properties of convex sets convex functions and concave function. Basic definitions to use Simplex method, Simplex method, Big-M method (Penalty method), Two phase method to solve LPP(without alternative solution and unbounded solution)

UNIT 2:

[14 Marks]

Transportation and Assignment Problems

Principle of duality in LPP, Primal LPP and method to find its dual LPP (Simple problems of above articles). The transportation problems: Mathematical and matrix form of TP. Initial solution of TP by NWCM, LCM and VAM, Optimum solution of TP by Modi method (u-v method) (except degenerate solution), Balanced and unbalanced TP(Simple problem), Assignment problem: Mathematical and matrix form of AP, Hungarian method to solve method(simple method).

UNIT 3:

[14 Marks]

Central difference interpolation & interpolation with unequal intervals:

Gauss's forward, Gauss's backward, Sterling's, Bessel's and Laplace- Everett's interpolation formulae.

Divided differences, Properties of divided difference, Relation between divided differences and forward difference, Newton's divided difference formula, Lagrange's interpolation formula, Inverse interpolation, Lagrange's inverse interpolation formula,

UNIT 4:

[14 Marks]

Numerical Differentiation & Integration::

Numerical Differentiation, Derivatives using Gregory-Newton's forward difference formula, Derivatives using Gregory-Newton's backward difference formula, Derivative using Sterling's formula. Numerical Integration, General quadrature formula, Trapezoidal rule, Simpson 's 1/3 rule, Simpson's 3/8 rule.

UNIT 5:

[14 Marks]

Numerical solution of ordinary differential equations

Solution by Taylor's series method, Taylor's series method for simultaneous first order differential equations, Picard's method, Picard's method for simultaneous first order differential equations, Euler's method, Improved Euler's method, Modified Euler's method.

Runge's method, Runge-Kutta methods, Higher order Runge-Kutta methods, Runge-Kutta methods for simultaneous first order differential equations, R-K methods for simultaneous first order differential equations, Predictor-Connector methods, Milne's method.

Text Book for Mathematics PAPER – 10 (A) (Theory) OPTIMIZATION (Unit - 1 & 2)

**Operation Research Theory and Applications',
J. K. Sharma, Second Edition,
MACMILLAN INDIA LTD**

Course of Mathematics PAPER – 10 (A) OPTIMIZATION

is covered by following Chapters/ Sections of the above mentioned book

Chapter 2:-

- § 2.6 [Only]

Chapter 3:-

- § 3.1, § 3.2, § 3.3 [Omit:- § 3.4]

Chapter 4

- § 4.1, § 4.2, § 4.3, § 4.4 [Omit:- § 4.5 and § 4.6]

Chapter 5

- § 5.1, § 5.2, § 5.3 [Omit:- § 5.4, § 5.5]

Chapter 9

- § 9.1 to § 9.5 § 9.6
- [Only § 9.6.1 Unbalanced Supply and Demand]
- [Omit: - § 9.6.2, § 9.6.3, § 9.6.4... etc in § 9.6]
- [Omit: - § 9.7, § 9.8]

Chapter 10 § 10.1 to § 10.3

- Appendix A A.10 and A.12
- [Omit: - § 10.4 to § 10.6]
- [Omit: - the rest]

The scope of the syllabus of **UNIT – 3, 4 & 5** is roughly indicated as under:

"Numerical methods" by Dr. V. . Vedamurthy & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.

Chap.7 (Except 7.7,7.8), Chap. 8. (Except 8.8), Chap. 9. (Except 9.5, 9.13), Chap. 11. (Except 11.1, 11.2,11.3, 11.6, 11.9, 11.17, 11.20)

Reference Books:

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addison Wasley, 1979

(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt. Ltd., 1966

(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 08 (B) (PRACTICAL)

Introduction to GeoGebra

- 1) Introduction to the interface of GeoGebra.
- 2) Use of tool bars to draw various Geometric Shapes including lines, line segments, triangles, polygons, circles and conics.
- 3) Drawing of graphs of any function of one variable for Cartesian equation using menu bar and to analyze the function using function inspector tool from tool menu and find its properties like maximum and minimum values .
- 4) Drawing of graph of curves using menu bar, when equation of the curves are given.
- 5) Drawing of various types of triangles including equilateral triangles, isosceles triangles, right angle triangles, acute triangle, obtuse triangle, and finding its various important centers including centroid, in-center, circum -- enter and ortho-center.
- 6) Introduction of various circle and compass tools and practice of drawing construction of various geometric shapes including triangles, polygons, squares, rectangle ..etc.
- 7) Verification of important theorems of geometry, algebra and calculus using GeoGebra.
- 8) Drawing and measuring various geometric shape using angle, distance, area and slop tools from tool bar.
- 9) Introduction and usage of reflect, rotate and translate by a vector tools.
- 10) Introduction to the usage of slider and basic animation.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6.
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be **15 marks** for Internal Practical Examination (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[8 Marks
Question 3:	Internal Practical Examination	[15 Marks
TOTAL		[50 Marks

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 09 (B) (PRACTICAL)
NUMERICAL ANALYSIS – II

- 1) Gauss forward interpolation formula.
- 2) Gauss backward interpolation formula.
- 3) Sterling's or Bessel's formula
- 4) Laplace-Everett's formula
- 5) Interpolation with unequal intervals.
- 6) Numerical differentiation.
- 7) Numerical integration.
- 8) Taylor's or Picard's
- 9) Euler's method.
- 10) Runge's method
- 11) Runge-Kutta's method
- 12) Milne's method

Journal and viva.

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Question 3:	Internal Practical Examination	[15 Marks
TOTAL		[50 Marks

B.Sc. Mathematics
SEMESTER -6
MATHEMATICS PAPER – 10 (B) (PRACTICAL)
OPTIMIZATION

- 1) Solve the given LPP using Graphical method.
- 2) Solve the given LPP using Simplex method.
- 3) Solve the given LPP using BIG -M method.
- 4) Solve the given LPP using TWO-PHASE method.
- 5) Obtain DUAL of the given Primal LPP;
- 6) Find the initial solution of given transportation problem using NWCM method.
- 7) Find the optimum solution of given transportation problem using LCM method.
- 8) Find the optimum solution of given transportation problem using VAM method.
- 9) Find the optimum solution of given transportation problem using MODI method.
- 10) Find the optimum solution of given assignment problem.

Journal and viva.

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(i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
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Question 3:	Internal Practical Examination	[15 Marks
TOTAL		[50 Marks