DEPARTMENT OF MATHEMATICS

SAURASHTRA UNIVERSITY
RAJKOT

SYLLABUS
M.Phil (Mathematics)
(CBCS)
WITH EFFECT FROM JUNE-2016

(Reaccredited "A" Grade by NAAC)
(CGPA 3.05)

DEPARTMENT OF MATHEMATICS

Course Structure and Scheme of Examination
For Choice based Credit System (CBCS)
(With effect from June-2016)

- Course: **M.Phil. (Mathematics)**
- Minimum Qualification:- M**.Sc. (Mathematics)**

Semester 1

Subject Code	Title of the Course	Course Credits	No. of Hrs. Per Week	Weightage For Internal Examination	Weightage For Semester End Examination	Total Marks	Duration Of Semester end Exam in hrs.
CMT – 10001	Algebra	4	4	30	70	100	3
CMT – 10002	Combinatorics and Graph Theory	4	4	30	70	100	3
CMT - 10003	Seminar and Problem Session	4	4	-	100	100	-
Total		**12**	**12**			**300**	

Semester 2

Subject Code	Title of the Course	Course Credits	No. of Hrs. Per Week	Weightage For Internal Examination	Weightage For Semester End Examination	Total Marks	Duration Of Semester end Exam in hrs.
CMT – 20001	Topology	4	4	30	70	100	3
CMT - 20002	Seminar and Problem Session	4	4	-	100	100	-
EMT – 20011 OR EMT – 20021	Complex Analysis OR Dissertation	4	4	30 -	70 -	100 100	3 -
Total		**12**	**12**			**300**	

- EMT 10021 (Dissertation) will be offered according to merit of first semester end examination.
- Maximum five students can opt dissertation and for the remaining students course EMT – 20021 will be compulsory.
- The choice of Dissertation is completely voluntary.
- The option for EMT course cannot be changed under any circumstances.
- The standard of passing is 40% of marks in semester end as well as in internal examinations of each course.
- Student will have to clear internal as well as external examinations. (i.e. internal examination with minimum 40% and external examination with minimum 40% is compulsory) and student can earn credits mentioned against each course.

M.Phil Semester 1

Sub. Code: **CMT-10001**

Core Sub. 1: **Algebra**

Unit 1

Ideals, Prime ideals, Maximal ideals, Operations on ideals, Extension and contraction, Modules, Chain conditions, Noetherian modules, and Artinian modules.

Unit 2

Rings and Modules of fractions, Local properties , Fractions and prime ideals, Primary decomposition, First Uniqueness theorem, and Second Uniqueness theorem.

Unit 3

Integral dependence, The going-up theorem, The going-down theorem and Valuation rings.

Unit 4

Discrete valuation rings, Dedekind domains, and Fractional Ideals.

This course is covered by the relevant portions from the book 'Introduction to Commutative Algebra' by M. F. Atiyah and I. G. Macdonald, Addison-Wesley Publishing Company, 1969

❖ References:

1. Commutative Algebra by N. Bourbaki, Springer-Verlag, New York, 1985.
2. Commutative Algebra with a view toward Algebraic Geometry by D. Eisenbud, Springer-Verlag, 1994.
3. Lessons on Rings, Modules, and Multiplicities by D. G. Northcott, Cambridge University Press, 1968.
4. Commutative Algebra by H. Matsumura, Benjamin/Cummings Publishing Company, 1980.
5. Commutative Ring Theory by H. Matsumura, Cambridge Studies in Advanced Mathematics 8, Cambridge University Press, 1986.
6. Commutative Rings by I. Kaplansky, The University of Chicago Press, Chicago, 1974.
7. Basic Commutative Algebra by Balwnt Singh, World Scientific, 2011.

M.Phil Semester 1

Sub. Code: **CMT-10002**

Core Sub. 2: **Combinatorics and Graph Theory**

Unit – 1: Combinatorics

- Some essential problems
- Binomial Coefficients
- Multinomial Coefficients
- The pigeonhole principle
- The principle of inclusion and exclusion

Unit – 2: Introduction to graph models

- Graphs and digraphs, Subgraphs
- Common families of graphs
- Walks and Distance
- Path, cycles and trees
- Characterizations and properties of trees
- Matrix representation
- Eulerian graph
- Hamiltonian graphs
- Plane graphs and planar graphs
- Kurtowski's two graphs

Unit – 3: Coloring of Graphs

- Vertex coloring and related results
- Edge coloring and related results.

Unit – 4: Domination in graphs

- Independent set and independence number
- Dominating set and domination number
- Bounds on the domination number

❖ References:-

1. Combinatorics and Graph Theory – John Harries, Jeffry Hirst, Michael Mossinghoff, Springer, 2008, second edition.
2. Graph Theory and Applications – Jonathan Gross and Jay Yellen, CRC Press.
3. A First Look at Graph Theory - J. Clark and D. A. Holton, World Scientific, 1969
4. Fundamentals of Domination in Graphs – T. W. Haynes, S. T. Hedetniemi, P. J. Slater, Marcel-Dekker

M.Phil. Semester 1

Sub. Code: **CMT-10003**

Core Sub. 3: **Seminar and Problem session**

Some open problems will be discussed and review of some research papers will be carried out. Student will have to prepare a detailed presentation of at least 15 minutes time duration and a viva-voce examination will be carried out.

M.Phil Semester 2

Sub. Code: **CMT-20001**

Core Sub. 1: **Topology**

Unit I

Zero sets and their properties. C- embeded and C^* - embeded subsets.

Unit II

Ideals and Maximal Ideals in C(X). Z – Filters and Z – Ultra Filters on a topological space. Z – Ideals and related examples.

Unit III

Fixed Ideals and Free Ideals. Characterisation of Compactness in terms of Ideals and Z - Filters.

Unit IV

Contruction of Stone- Cech Compactification using 1) Product of Spaces and 2) Zero Sets. Properties of Stone – Cech Compactification.

Unit V

Some special Banach Algebras

❖ References:

1. Rings of Continuous functions(Chapter -1,2,3,4 and 6) by L. Gillman and M. Jerison, Springer Verlag (1986)
2. General Topology by S. Willard, Addison – Wesley Publishing Company (1970) (Chapter 6, Article no.19)
3. Introduction to Topology and Modern Analysis by G. F. Simmons, Tata McGraw - Hill (2004) (Chapter no. 14)

M.Phil Semester 2

Sub. Code: **CMT-20002**

Core Sub. 2: **Seminar and Problem session**

Some open problems will be discussed and review of some research papers will be carried out. Student will have to prepare a detailed presentation of at least 15 minutes duration and a viva-voce examination will be carried out.

M.Phil Semester 2

Sub. Code: **EMT-20011**

Elective Sub. 1: **Complex Analysis**

Unit – 1

Infinite product, Weierstrass Factorization theorem, Space of continuous functions, normal family, equicontiounsess family, Arzela – Ascoli theorem, space of analytic functions, locally bound family of analytic functions, Montel's theorem.

Unite – 2

Entire functions, Jensen's formula, The genus and order of an entire function, Hadarmard's factorization theorem.

Unit – 3

The range of analytic functions, Block's theorem, The little Picard's theorem, Schottky's theorem, The great Picard's theorem.

Unit – 4

Analytic manifolds, Riemann surfaces, Examples, Holomorphic mapping between analytic manifold and their properties, Meromorphic functions on Riemann surfaces, covering spaces and their properties.

❖ References:

1. J. B. Conway, Functions of one complex variables, Springer International Edition
2. O. Forster, Lectures on Riemann Surfaces, Springer – Verlag
3. R. Narasinhan, Y. Nievergelt, Complex analysis in one variable, Birkhauser

M.Phil Semester 2

Sub. Code: **EMT-20021**

Elective Sub. 2: **Dissertation**

Student will prepare a dissertation under the guidance of faculty of the department on any topic of mathematics. This dissertation will be examined according to rules and regulations imposed time to time by university authority.