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

(Reaccredited “A” Grade by NAAC)
(CGPA 3.05)
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

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Title of the Course</th>
<th>Course Credits</th>
<th>No. of Hrs. Per Week</th>
<th>Weightage For Internal Examination</th>
<th>Weightage For Semester End Examination</th>
<th>Total Marks</th>
<th>Duration Of Semester end Exam in hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMT – 10001</td>
<td>Algebra</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>70</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>CMT – 10002</td>
<td>Combinatorics and Graph Theory</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>70</td>
<td>100</td>
<td>3</td>
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<tr>
<td>CMT - 10003</td>
<td>Seminar and Problem Session</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Total</td>
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Semester 2

<table>
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<th>Course Credits</th>
<th>No. of Hrs. Per Week</th>
<th>Weightage For Internal Examination</th>
<th>Weightage For Semester End Examination</th>
<th>Total Marks</th>
<th>Duration Of Semester end Exam in hrs.</th>
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</thead>
<tbody>
<tr>
<td>CMT – 20001</td>
<td>Topology</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>70</td>
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<tr>
<td>CMT - 20002</td>
<td>Seminar and Problem Session</td>
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<td>4</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>-</td>
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<td>EMT – 20011</td>
<td>Complex Analysis</td>
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<td>4</td>
<td>30</td>
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<td>100</td>
<td>3</td>
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<tr>
<td>OR EMT – 20021</td>
<td>Dissertation</td>
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<td>Total</td>
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<td>12</td>
<td>12</td>
<td></td>
<td></td>
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</table>

- 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.
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:
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
- Kurthowski’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:

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. $C$- embedded and $C^*$ - embedded 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

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)
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.

**Unit – 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. Narasinh, 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.