ADD ON:
Major Elective Courses
for M.Sc. in Mathematics at Semester IV
(w.e.f. Academic Session 2021-22)

Department of Mathematics
Bankura University
Bankura

The Structure of the Courses:

Semester & Duration	Course Type	Course Code	Name of the Course	Class Hours/Week	L	T	P	Credit	I.A.	ESE
Fourth Semester & Six Months	Major Elective 3/ Major Elective 4	Math-403ME/ Math-404ME	Advanced Real Analysis	4	3	1	0	4	10	40
			Elasticity	4	3	1	0	4	10	40

Note: The courses will be offered according to availability of Faculty members at the department. If offered, it is discretion of the Departmental Committee to decide whether the Course 'Advanced Real Analysis/Elasticity' will come under Course Code 'Math-403ME' or 'Math-404ME'.

The details syllabi are provided in the next two pages viz. Page 2 and Page 3.

Paper: Math-403ME or Math-404ME

Advanced Real Analysis

Course Objectives: This course is mainly designed to give some ideas such as semicontinuous functions, Cantor ternary functions, absolutely continuous functions and convex functions. The ideas of differentiability and derivatives are also included to study.

Course Specific Outcomes: On completion of this course, one would gain

- Deeper knowledge on the properties of real-valued functions of a real variable
- Clear ideas on construction of Cantor ternary functions
- The knowledge on relations among continuous functions, absolutely continuous functions, convex functions

Total Lectures: 50 Marks: 50

- Cardinal and ordinal numbers: Equipotent sets, Cardinal numbers, Order types, Ordinal numbers
- Semicontinuous functions and their properties.
- The sets of the first category, second category and residual sets. Vitali covering theorem
- Approximately continuous functions and its properties. Characterization of approximate continuous functions
- Functions of Bounded Variations: Points of bounded variation and nonbounded variation, semicontituity of variation function, properties of the sets of points of bounded variation and nonbounded variation.
- Absolutely continuous functions, algebraic properties of absolutely continuous functions, relation of absolutely continuous functions to the functions of bounded variation and uniformly continuous functions, expression of absolutely continuous functions as a difference of two increasing functions, continuous functions, absolute continuity and derivatives.
- Cantor ternary functions: Expression of Cantor ternary functions, well-definiteness of Cantor ternary functions, range of the functions, the function is increasing, continuous but not absolutely continuous, determination of interval and its length on which the functions is constant.
- Uniform differentiability and its properties. Dini's derivates, their existence and their properties, Young's theorem on derivatives.
- Convex functions and its properties, Jensen inequality on convex functions.

References:

1. R. G. Bartle: The Elements of Real Analysis, 2nd Edition, 1975
2. B. S. Thomson,J. B. Bruckner&A. M. Bruckner: Real Analysis, 2ndEdition, 2008
3. B. K. Lahiri and K. C. Roy: Real Analysis, The World Press Pvt. Ltd., 2008
4. I. P. Natanson: Theory of Functions of a Real Variable, Third Printing, 1964
5. E. M. Stein and R. Shakarchi: Real Analysis, Measure Theory, Integration and Hilbert Spaces, 2005
6. J. Yeh: Lectures on Real Analysis, 1st Edition, 1999
7. E. Zakon: Mathematical Analysis, Volume I, 2004

Evaluation: End semester examination- 40 marks, 05 questions to be answered out of 08questions carrying 08 marks of each, **Internal Assessment**- 10 marks.

Papers: Math-403ME & Math-404ME

Elasticity

Course Objectives: The main aim of this course is to teach the student about the concept of Neumann and Dirichlet's problem, Theorem of Betti and Rayleigh, Minimum potential energy theorem and the idea of plane stress and strain.

Course Specific Outcomes: After completion of this course, the students learn about –

1. Applications of the continuum theory in Torsional problem, Flexure problem and Deformation problem.
2. Idea of the problems of generalized plane stress and strain

Total Lectures: 50 ***Marks- 50***

Saint-Venant's semi-inverse method of solution (Statement), formulation of torsion problems and the equations satisfied by the torsion function and the boundary condition. Formulation of torsion problems as an internal Neumann problem,Dirichlet's problem and Poisson's problem, Prandtl's stress function,shearing stress in torsion problem, Solution of torsion problem for simple sections method of solution of torsion problem by conformal mapping. (25L)
Flexure problem: Reduction of flexure problem to Neumann problem, solution of flexure problem for simple sections. (8L)
Potential energy of deformation. Reciprocal theorem of Betti and Rayleigh, theorem of minimum Potential energy. (8L)
Plane problem: plane strain, plane stress, generalised plane stress. Basic equations. Airy's stress function. Solution in terms of complex analytic function. (9L)

References:

1. Y. A. Amenzade – Theory of Elasticity (MIR Pub., 1979)
2. A. E. H. Love – A treatise on the Mathematical Theory of Elasticity, CUP, 1963.
3. I. S. Sokolnikoff– MathematicalTheory of Elasticity, Tata McGraw Hill Co., 1977.
4. W. Nowacki – Thermoelasticity(Addison-Wesley Pub. Co., 1962)
5. Y. C. Fung- Foundations of Solid Mechanics, PHI, 1965.
6. S. Timoshenk and N. Goodies, Theory of Elasticity, McGrwa Hill Co., 1970.
7. N. I. Muskhelishvili- Some Basic Problems of the mathematical theory of Elasticity, P. Noordhoff Ltd., 1963.

Evaluation: End semester examination – 40 marks, 05 questions to be answered out of 08 questions carrying 08 marks of each, **Internal Assessment** – 10 marks.