MT 122: Calculus-II

Unit 1: Differentiation

(10 lectures)

1.1. The Derivatives:

Definition of the derivative of a function at a point, every differentiable function is continuous, Rules of differentiation, Caratheodary'stheorem(without proof), The chain rule, Derivative of inverse function (without proof, only examples).

1.2 The Mean Value Theorems: Interior extremum theorem, Mean Value theorems and their Consequences, Intervals of increasing and decreasing of a function, first derivative test for extrema.

Unit 2: L' Hospital Ruleand Successive Differentiation(10 lectures)

- 2.1 L'Hospital Rule: Indeterminate forms, L'Hospital Rules(without proof)
- 2.2 Taylor's theorem: Taylor's theorem and Maclaurin's theorem with Lagrange's form of remainder (Without proof).
- 2.3 Successive Differentiation: The nth derivative and Leibnitz theorem for successive differentiation.

Unit 3: Ordinary Differential Equations

- 3.1 Linear first order equations.
- 3.2 Separable equations.
- 3.3 Existence and Uniqueness of solutions of nonlinear equations.

Unit 4: Exact Differential Equations

(08 lectures)

(08 lectures)

- 4.1 Transformation of nonlinear equations to separable equations.
- 4.2 Exact differential equations.
- 4.3 Integrating factors.

Textbooks:

1. Introduction to Real Analysis by R.G. Bartle and D.R. Sherbert, John Wiley and Sons, Inc., Fourth Edition.

Unit 1: Chapter 6: Sec. 6.1(6.1.1 to 6.1.8), Sec 6.2(6.2.1 to 6.2.8). Unit 2: Chapter 6: Sec 6.3(6.3.1 to 6.3.7), Sec 6.4(6.4.1 to 6.4.3).

- Differential Calculus by Shanti Narayan, Tenth Revised Edition. Units 2: Chapter 5: Sec. 5.1 to 5.6.
- 3. Elementary Differential equations, William F. Trench, E-book (Free download)
- Unit 3: Chapter 2: Sec 2.1 to 2.3. Unit 4: Chapter 2: Sec 2.4 to 2.6.

Reference books:

- 1. Introduction to Real analysis, William F.Trench, Free edition, 2010.
- 2. Calculus of a single variable Ron Larson, Bruce Edwards, tenth edition.
- 3. Elementary Analysis, The Theory of Calculus, Kenneth A. Ross, Springer Publication, second edition.
- 4. Calculus and its Applications, Marvin L. Bittinger, David J. Ellenbogen and Scott A. Surgent, Addison Wesley, tenth edition.
- 5. Ordinary and partial Differential equations, M.D. Raisingania, S. Chand and Company, 2009.

MT 123: Mathematics Practical

(Practical based on the applications of articles in MT 121 and MT 122)

In Semester-II, we should conduct 4 written practical and 2 practical on maxima software for each paper MT-121 and MT-122.

List of Practical

Practical 1 : Problems on Unit 1 (Written) from MT-121.

Practical 2 : Problems on Unit 2 (Written) from MT-121.

Practical 3 : Problems on Unit 3(Written) from MT-121.

Practical 4 : Problems on Unit 4(Written) from MT-121.

Practical 5 : Problems on unit 1 and unit 2 from MT-121 using maxima software.

- Practical 6 : Problems on Unit 3 and Unit 4 from MT-121 using maxima software.
- Practical 7: Problems on Unit 1 (Written) from MT-122.
- Practical 8 : Problems on Unit 2 (Written) from MT-122.
- Practical 9 : Problems on Unit 3(Written) from MT-122.

Practical 10 :Problems on Unit 4(Written) from MT-122.

Practical 11 : Problems on unit 1 and Unit 2 from MT-122using maxima software.

Practical 12: Problems on Unit 3 and Unit 4from MT-122 using maxima software. **Note:**

1 The soft copy of practical on maxima software will be prepared and provided by the Board of Studies in mathematics.

2. Practicals on maxima software can be performed on computer and android mobiles.

3. Android mobiles are allowed for practical examination on maxima software .

4.Practical examination 25 marks on written problems, 10 marks for problems on maxima software (5 marks for writing syntax and 5 marks to perform the same on android mobile or computer).