Teaching Program

Course title   MTH10201 Mathematical Induction, Sequences and Series **Semester 2/2023**

Course instructors

Asst.Prof.Dr.SAEID ZAHMATKESH KOMELEH   Sec 31

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Course description

Mathematical induction. Sequences, series, the integral test, the comparison test, the ratio test, the alternating series and absolute convergence tests, power series, Taylor's formula, Binomial expansion. Periodic functions, Fourier series.

Objectives

After completion of this course, students will be able to

1. Prove simple mathematical statement by induction.

2. Give definitions of various types of sequences and series.

3. Explain the concepts of convergent and divergent sequences and series and be able to test & verify them.

4. Describe and convert functions to power, Taylor's or Fourier series.

Ultimate Learning Outcome

Able to prove statements by mathematical induction, determine the convergence of sequences and series, and calculate the Fourier series of periodic functions.

Teaching Plan

Week	Content	Learning Outcomes	Learning Activity / Practice
1	- Mathematical induction - Sequences of real numbers	-Prove simple mathematical statement by induction -Give definitions of various types of sequences and series - Explain the concepts of convergent and divergent sequences and series and be able to test & verify them	Lecture
2	- Infinite series - Integral test - Comparison test - Ratio test	-Give definitions of various types of sequences and series - Explain the concepts of convergent and divergent sequences and series and be able to test & verify them	Lecture / Self Practice (LEB2)
3	- Alternating series, absolute convergence - Power series, radius and interval of convergence	Explain the concepts of convergent and divergent sequences and series and be able to test & verify them	Lecture / Self Practice (LEB2)
4	- Taylor's series, Maclaurin series - Binomial series - Periodic functions, odd and even functions	-Describe and convert functions to power, Taylor's or Fourier series.	Lecture / Self Practice (LEB2) / Tutorial
5	Fourier series of a periodic function	-Describe and convert functions to power, Taylor's or Fourier series.	Lecture / Self Practice (LEB2) / Tutorial
6	Exam 1 (Monday 19th, February 2024 Time 9.00-11.00 am.)		

Course Level Learning Outcomes : CLOs

Learning Outcome	Assessment	Week	Assessment Portion
Able to prove statements by mathematical induction, determine the convergence of sequences and series, and calculate the Fourier series of periodic functions.	1st Examination	6	100%

Assessment Rubric

Level 1	No evidence
Level 2	Able to prove simple statements by mathematical induction. Able to identify monotonically increasing and decreasing sequences Able to identify periodic functions.
Level 3	Determine the convergence of a sequence. Able to explain and determine whether a given series converges or diverges. Able to calculate the Fourier series of periodic functions.
Level 4	Able to prove statements by mathematical induction Able to decide whether series, alternating series and power series converge or diverge by choosing suitable test. Able to convert functions to power, Taylor's or Fourier series.
Level 5	Able to find the interval of convergence of a power series. Able to select the appropriate technique for power series computation. Able to calculate and determine convergence of Fourier series and their properties.

Grade	Scales (total 100 points)
A (Rubric level 5)	>= 80
B+ (Rubric level 4)	70 – 79
B (Rubric level 4)	60 – 69
C+ (Rubric level 3)	50 – 59
C (Rubric level 3)	40 - 49
D+ (Rubric level 2)	33 - 39
D (Rubric level 2)	25 - 32
F	< 25

Textbooks and Core Instructional Materials

1) Anton H., Bivens I., Davis S., *Calculus*, 7th ed., New York, John Wiley & Sons, 2002
2) Finney R.L., Weir M.D., Giordano F.R., *Thomas' Calculus*, updated 10th ed.,

   New York, Addison Wesley, 2003.
3) Smith, R.T., Minton, R.B., *Calculus*, 2nd ed., New York, McGraw-Hill, 2002

Remark:

All students must join

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