SCHOOL OF MATHEMATICAL SCIENCES

COURSE OUTLINE
SEMESTER 1 2020/2021

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## 1. COURSE INFORMATION

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| Course Code/Name | : | Advanced Calculus MAT201 |
| No. of Units | : | 4 |
| Lecture Time | : | Tue 11am – 12pm (DK SK3), Thurs 10am – 11am (DK G31), Fri 8am – 9am (DK G) |
| Tutorial Time | : | Mon 4pm – 5 pm; Tue 9am – 10am; Wed 8am – 9 am, 2pm – 3pm (all PPSM 204); Tue 4pm – 5pm (BT146) |
| Instructor | : | Dr. Lee See Keong, Dr. Norazrizal Aswad bin Abdul Rahman |
| Email | : | sklee@usm.my, aswad.rahman@usm.my |
| Office | : | PPSM Room 111, Room 123 |
| Phone | : | 04-6532070, 04-6533944 |
| Webpage | : | |

## 2. COURSE SYNOPSIS

This course discusses further the basics of calculus. Convergence of sequences and series, as well as improper integrals are discussed. Representations of functions as power series are studied. The second half of the course focuses on the theory of limits, continuity, differentiation and integration of functions of several variables, up to double integration.

3. LEARNING OUTCOME

| No. | Course Outcome | PO | LT | SS | Assessment |
|---|---|---|---|---|---|
| 1 | Explain the fundamental concept and theories related to functions of one and several variables correctly | PO3 | C6 | CTPS2 | Assignment, Test, Quiz |
| 2 | Describe clearly the concept for functions of several variables and their occurrences in the real world | PO6 | A3 | TS2 | Assignment |
| 3 | Display effort to investigate or search information in completing a task related to functions of one and several variables | PO7 | A5 | LL1 | Assignment |
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4. GRADING

| COURSEWORK (60%) | | | | | |
|---|---|---|---|---|---|
| No. | Assessments | CO | PO | LT | Marks |
| 1 | Assignment | CO1<br>CO2<br>CO3 | PO3<br>PO6<br>PO7 | C6<br>A3<br>A5 | 20<br>5<br>5 |
| 2 | Test | CO1 | PO3 | C6 | 20 |
| 3 | Quiz | CO1 | PO3 | C6 | 10 |
| FINAL EXAMINATION (40%) | | | | | |

| Range | 80-100 | 70- | 64- | 58- | 52- | 46- | 40- | 36- | 32- | 28- | 25- | 0- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |

5. REFERENCES


Stewart, J. (2016). Calculus - Metric Version, 8th edition. Cengage Learning Inc (textbook)

How, G.A. and Ong B.H. (2008) Calculus Vol. 2. Penerbit USM
Hass, J., Weir, M. and Thomas, G. (2020). University Calculus:Early Transcendentals, 4th edition. Pearson
Spivak, M. (2008) Calculus, 4th edition, Publish or Perish

6. COURSE OUTLINE & CLASS SCHEDULE*

| WEEK | DATE | LECTURER | TOPICS | REMARK |
|---|---|---|---|---|
| 1 | 12-16 Oct 2020 | Lee | Indeterminate forms and l'Hospital's rule<br>Improper integrals – Type I | |
| 2 | 19-23 Oct 2020 | Lee | Improper integrals – Type II<br>Sequences – definition, examples<br>Convergent and Divergent sequences<br>Bounded and Monotonic sequences – Monotone Convergence Theorem | |
| 3 | 26-30 Oct 2020 | Lee | Series – definition, properties<br>Test for Divergence<br>Integral Test | Quiz 1 |
| 4 | 02-06 Nov 2020 | Lee | Comparison Test, Limit Comparison Test<br>Alternating series Test | |
| 5 | 09-13 Nov 2020 | Lee | Absolute and Conditionally convergences<br>Ratio Test and Root Test<br>Power series<br>Radius and Interval of convergence | Assignment 1 due |
| 6 | 16-20 Nov 2020 | Lee | Differentiability and Integrability of power series<br>Representation of functions as power series<br>Taylor and Maclaurin series | Test 1 (19/11/2020) |
| 7 | 23– 27 Nov 2020 | Lee | Taylor polynomials<br>Taylor's Theorem<br>Several forms of remainder | Quiz 2 |
| 8 | | MID-SEMESTER BREAK | | |
| 9 | 07-11 Dec 2020 | Aswad | Functions of several variables<br>Limit and Continuity of functions of several variables<br>Partial derivatives | |
| 10 | 14-18 Dec 2020 | Aswad | Chain rule<br>Implicit differentiation.<br>Directional derivatives | |
| 11 | 21–25 Dec 2020 | Aswad | Tangent plane<br>Linear approximation and Differentials<br>Differentiable function | Quiz 3 |
| 12 | 28 Dec 2020 - 01 Jan 2021 | Aswad | Gradient vector or Total derivative<br>Differentiability | |
| 13 | 04-08 Jan 2021 | Aswad | Maximum and Minimum values<br>Method of Lagrange Multiplier | Test 2 (07/01/2021) |

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|---|---|---|---|---|
| 14 | 11-15 Jan 2021 | Aswad | Double integrals over rectangular region<br>Double integrals over general region<br>Double integral in polar form<br>Change of variables | Assignment 2 due |
| 15 | 18-22 Jan 2021 | Aswad | Triple integrals – rectangular box<br>Triple integrals – general region<br>Cylindrical coordinate<br>Spherical coordinate | Quiz 4 |
| 16 | | REVISION WEEK | | |

* Subject to change

7. RESOURCES ON E-LEARNING

(Lecture) Tuesday: https://usm-cmr.webex.com/usm-cmr/j.php?MTID=mf2e16897cfca0f33e330100a43fe2413
Thursday: https://usm-cmr.webex.com/usm-cmr/j.php?MTID=m574e53c426335f451065d2592c1d5952
Friday: https://usm-cmr.webex.com/usm-cmr/j.php?MTID=medcdd158971c9baafed03b805852fc11

8. FURTHER INFORMATION

Student who has an emergency on the day of a test should inform the lecture by an email as early as possible. **Otherwise no make-up test will be considered**.