

Sultan Qaboos University, College of Science  
Department of Mathematics and Statistics  
**MATH 2108 CALCULUS II Fall 2010**  
**Course Outline**

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### 1. Basics

**Prerequisite:** MATH 2107 Calculus I

**Text:** *Calculus: Early Transcendental Functions* by Smith-Minton  
McGraw Hill, 2008 (3rd Edition) (SQU Special Edition, Book II)

**Format:** 2 – 2 – 3

**Course Coordinator:** Dr. S. I. Zaman

**Office:** New College of Science Building Ground Floor, Room # 0203

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### 2. General Information

**Course Description:** This is a second course in a series of three calculus courses. The course primarily feeds on the notions as presented in Calculus I course and deals with applications (computation of area, volume, arc length etc) and further techniques of integration of various types including proper and improper integrals. The course also introduces the notion of sequences and infinite series, to develop the ideas of power series and their convergences. Included also are the ideas of polar coordinate system, the polar curves and some basic polar calculus.

**Course Objective:** Upon completion of this course students should be able to: use integration to find the area between two curves, volumes by slicing and cylindrical shells, the length of a plane curve, and the area of a surface of revolution; use various methods of integration such as integration by parts, trigonometric substitutions, using partial fractions and tables of integrals; determine the convergence of improper integrals; determine the convergence of sequences and series - find the radius and interval of convergence of power series - construct and use Maclaurin or Taylor series, differentiate and integrate power series; sketch polar curves and do the basic calculus of polar equations.

**Assessment:** There will be a Homework assignment, 4 quizzes, 2 tests and a final examination. The Homework assignment will be posted on the Moodle on Wednesday in week 10 and to be submitted within a week.

Assessments	HW	Quizzes	Test 1	Test 2	Final
Schedule	Wk 10	Wks 3, 5, 8, 14	26 Oct Wk 6 6:15 pm	5 Dec Wk 12 6:15 pm	Jan 1, 2011 11am
Weights	5%	15%	20%	20%	40%

### 3. Delivery Methods

- 2 hours of Lecture + 2 hours of Tutorial per week
- Tutorial problems will be (typically) from the Lecture topics of the week
- Necessary formulae, tables, related informations and notes will be posted on the *Moodle*
- Topics for the quizzes, the tests and the final will be announced well in advance
- Students' participation (questions or seeking clarifications) during lecture is encouraged

#### 4. Weekly schedule

Weeks	Sections	Weeks	Sections	Weeks	Sections
1: 18/9	5.1, 5.2	7: 30/10	8.1	13: 11/12	8.7, 8.8
2: 25/9	5.3, 5.4	8: 6/11	8.2 <b>Qz 3</b>	14: 18/12	9.4 <b>Qz 4</b>
3: 2/10	6.1*, 6.2 <b>Qz 1</b>	9: 13/11	8.3	15: 25/12	9.5
4: 9/10	6.3	10: 20/11	8.3, 8.4 <b>HW</b>	16: 1/1	EXAM WK
5: 16/10	6.4, 6.5* <b>Qz 2</b>	11: 27/11	8.4, 8.5	17: 8/1	EXAM WK
6: 23/10	6.6 <b>Test 1</b>	12: 4/12	8.6 <b>Test 2</b>		

Week 9 Eid Al Adha / National day, Wk 12 Islamic new year

#### 5. Course Contents

<p><b>5 Applications of the Definite Integral</b></p> <p>5.1 Area Between Two Curves 5.2 Volumes: Slicing; Disks and Washers 5.3 Volumes by Cylindrical Shells 5.4 Arc Length and Surface Area</p> <p><b>6 Integration Techniques</b></p> <p>6.1# Review of Formulas and Techniques 6.2 Integration by Parts 6.3 Trigonometric Techniques of integration 6.4 Integration of Rational Functions using Partial Fractions 6.5# Integration Tables 6.6 Improper Integrals</p>	<p><b>8 Infinite Series</b></p> <p>8.1 Sequences of Real numbers 8.2 Infinite Series 8.3 The Integral Test and Comparison Tests 8.4 Alternating Series 8.5 Absolute Convergence and the Ratio test 8.6 Power Series 8.7 Taylor Series 8.8# Applications of Taylor Series</p> <p><b>9 Parametric equations and Polar Coordinates</b></p> <p>9.4 Polar Coordinates 9.5 Calculus and Polar Coordinates</p>
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#### 6. Suggested problems

Sec.	Practice Problems	Tutorial Problems
5.1	2, 3, 8, 9, 11, 22, 23, 26, <b>45</b> , 49	1, 4, 10, 12, 19, 21, 24, <b>27, 48, 50</b>
5.2	2, 3, 6, 18, 25, 31, 32, <b>33, 35</b>	1, 5, 17, 20, 27, 36, <b>37, 39</b>
5.3	3, 12, 13, 26, 28, 30, 32, <b>38</b>	1, 4, 9, 15, 17, 23, 27, 29, 31, <b>35</b>
5.4	6, 10, 12, 13, 36, 40, <b>50</b>	5, 7, 8, 9, 11, 14, 38, 42, <b>51, 52</b>
6.1#	5, 10, 15, 22, 24, 31, 32, 47	3, 8, 17, 20, 21, 30, 35, 38, 48
6.2	7, 12, 22, 27, 30, 39, 40, 41, 47, 56	2, 5, 6, 10, 14, 15, 17, 25, 29, 33, 42, 57, 63
6.3	2, 8, 12, 20, 21, 26, 33, <b>35</b>	1, 3, 9, 11, 13, 15, 17, 22, 27, 36
6.4	3, 9, 14, 21, 22, 23, <b>37</b>	1, 6, 11, 18, 28, 34, <b>38</b>
6.5#	1, 4, 6, 8, 12, 15, 23, 27	
6.6	1, 3, 6, 8, 13, 18, 26, 34, 38, 39, 45, 53 – 58	2, 4, 5, 10, 12, 14, 16, 23, 27, 42, 46, 59, 60
8.1	2, 4, 6, 11, 15, 21, 22, 30, 35, 38, 41, 55, 58	1, 3, 12, 16, 17, 18, 20, 23, 26, 28, 31, 32, 36, 37, <b>45, 42, 54, 57</b>
8.2	27, 28, 33, 35, 36, <b>47, 48</b>	1 – 22, 32, 34, <b>49</b>
8.3	3, 7, 9, 10, 11, 14, 20, 24, 25, 32, 42 – 44, 56	1, 5, 8, 12, 13, 15, 19, 21, 22, 23, 26, 41, 50, 55, <b>57</b>
8.4	3, 8, 15, 21, 28, 36, 41	1, 6, 10, 16, 19, 25, 33, 35, <b>39, 40</b>
8.5	1, 13, 17, 23, 27, 34, 43	3, 7, 11, 19, 22, 26, 31, 41, 42
8.6	1, 9, 16, 21, 31, 36, 40	3, 12, 14, 19, 26, 32, 33, 37, 38, 41, 44
8.7	5, 8, 9, 10, 13, 23, 29, 32, 35, 35	1, 3, 6, 7, 11, 14, 24, 31, 33, 34, 38, <b>39</b>
8.8#	11, 15, 33, 35, 41	7, 13, 17, 34, 36, 42, <b>44</b>
9.4	30, 31, 38, 35, 41, 44, 50	1 – 26, 29, 32, 33, 37, 39, 47, 57 – 62
9.5	5, 7, 18, 20, 30, 35, 47	1, 3, 9, 19, 25, 26, 29, 36, 48

Go to next page for further notes on the content

- # For 8.8, only examples 8.1 – 8.5 and the part on Binomial Series (pp 401 – 402) are included. Some parts of 6.1 and 6.5 are to be completed through self-study. Integration tables for 6.5 will be posted on the *Moodle*.
- The question numbers in bold have some word content.
- \* Derive only the integral without computing it; \*\* assume  $x > 3$  and  $x \geq 1$  for # 21 and # 22 respectively.
- Only by studying and grasping the relevant explanations, understanding the key ideas, studying the examples and practising on as many problems, can a student achieve the required level of attainment in this course. Students must make every effort to complete, as a bare minimum, the suggested exercises, as detailed above, if they aim to be successful in this course.

## 6. Instructors

Dr. Purnama	Dr. Wanjala	Dr.Zaman	Dr. Al Salman	Dr. Kamal
Sec 10	Sec 20	Sec 30	Sec 40	Sec 50
Room 0128	Room 0218	Room 0203	Room 0238	Room 0236

Dr. Yoshira	Dr. Al Sharawi	Dr. Nafa	Dr. Ben Huj Rhouma	Ms. Al Ghabshi
Sec 60	Sec 70	Sec 80	Sec 90	Sec 100
Room 0216	Room 0224	Room 0234	Room 0227	Room 0150

\* Located in the old College of Science building, the rest of the offices are in the New college of science building

## 7. Policies

- There will be no make up quizzes or tests whatsoever.
- If an absence is supported by a valid reason (acceptable as per university regulation), then his/her grade will be based on the performances on the remaining part for that assessment component.
- Model solutions for tests and final exam will be posted on the *Moodle* .
- No late Homework submission will be accepted. All Homework must be submitted by 4 pm latest on the day of submission.
- All requests for a review of the answer scripts must be made to the instructor during the class on the **same day** the tests are returned.
- The instructor/grader reserves the right to deny review or to penalize if the answer script is deemed suspicious e.g. evidence of overwriting, the script may have been taken outside .
- Class attendance is obligatory.
- An *Absentee Warning Notice* will be served if a student is absent for more than 10% (6 hrs) of the time (University regulation B11).
- An *Absentee Failure Notice* will be served if a student is absent for more than 20% (12 hrs) of the time (University regulation B11) and the student will be deemed to have withdrawn from the course with an FW grade.
- All mobile phones should remain either switched off or in silent mode during all class sessions. During exams these must be kept switched off at all times.

## 8. Additional help

- The instructors will have their Office Hours posted outside their offices.
- Students are strongly advised to consult with their instructors (as listed above) during their office hours or by appointment.
- Typically, in each semester there usually is a *Maths Drop in Centre* for extra maths help.

## 9. Student Requirements

- Students must read and understand all of the assigned topics in the textbook.
- Students must do all the *Practice problems* (instructors may do a few of these during Lecture).
- Students must do all the *Tutorial problems* (instructors may help with few of these during tutorial).
- If there is an idea that needs more clarity, the student must ask the instructor for further explanation either during the class or during his / her Office hours.
- By the end of each week, students must be done with all reading, understanding and problem solving as assigned for that week, to be well prepared for any quizzes or to understand new ideas in the week that follows.
- Students must bring in the class either the textbook or the relevant photocopies of the pages.
- During class, students must keep cell phones either switched off or in silent mode.
- Students must not share any materials (calculators, pencil etc) during quizzes, tests and exam.
- Students must check their emails and visit the Moodle regularly for any new postings.

## 10. Learning Outcomes

1. **Use** definite integrals to **calculate** the area between two curves.
2. **Use** definite integrals to **formulate** and **calculate** the volume of a solid of revolution by the methods of disks and cylindrical shells; and to **formulate** and **calculate** the volume with given cross section.
3. **Apply** definite integrals to **calculate** the length of a plane curve, and the surface area of a solid of revolution.
4. **Evaluate** integrals **using** Integration by parts, elementary substitutions, trigonometric substitution, or partial fractions.
5. **Identify** an improper integral and **Determine** the convergence or divergence of improper integrals.
6. **Determine** whether a sequence of real numbers is increasing or decreasing; **evaluate** the limit to **determine** the convergence of a sequence.
7. **Evaluate** the sum of a geometric series and a telescoping sum.
8. **Determine** the convergence of series, **using**:  $k$ th term test, Integral test, Comparison and Limit Comparison tests. Also, **Understand** what a  $p$ -series is and **determine** its convergence.
9. **Classify** the alternating series into absolutely convergent, conditionally convergent, or divergent; and **approximate** the sum of a convergent alternating series.
10. **Apply** the ratio or root test to **determine** the radius and interval of convergence of power series.
11. **Construct** Maclaurin or Taylor series using the definition and by **using**: substitution, differentiation and integration.
12. **Use** the series to **calculate** sums of particular series evaluated at specific values of the variable, **evaluate** some special or unusual limits, and **approximate** definite integrals.
13. **Convert** polar coordinates into Cartesian and vice versa.
14. **Construct** a polar curve and **calculate** slopes of tangent lines on polar curves
15. **Formulate** and **calculate** the length of a curve, and the area between curves in polar coordinates.