**SYLLABUS FOR SM221**
**SPRING 2017**

**TEXT: CALCULUS, Early Transcendentals, 8e by James Stewart**

| DAY | SECTION | TOPIC | PROBLEMS |
|---|---|---|---|
| 1 | 12.1-12.4 | Review of Vectors | **12.1:** 15, 37 / **12.2:** **7**,25,26,32<br>**12.3:** 19, 28, 41,50 / **12.4:** 19,31 |
| 2 | 12.5 | Review of Lines and Planes | **12.5:**<br>1,2,4,5,7,10,20,24,26,27,31,41,45,57 |
| 3 | 12.6 | Cylinders | **12.6:** 1,4,5,**6**,8 |
| 4 | 12.6 | Quadric Surfaces | **12.6:** 11,13,**14**,**16**,19,21-28 |
| 5 | 13.1 | Vector Functions and Space Curves | **13.1:** 7,8,12,18,21,**24**,25,31,42,50 |
| 6 | 13.2 | Derivatives and Integrals of Vector Functions | **13.2:** 3,5,7,25,29,31,35,41 |
| 7 | 13.3 | Arc Length | **13.3:** 1,2,3,5,11 |
| 8 | 13.4 | Motion in Space | **13.4:** 3,9,10,**15**,23,24,25,**26**,31 |
| 9 | | **REVIEW** | |
| 10 | | **TEST 1** | |
| 11 | 14.1 | Functions of Several Variables | **14.1:** 2,9,15,25,27,35,41,42,44,45,67,68 |
| 12 | 14.3 | Partial Derivatives | **14.3:** 3,5,6,7,**13**,15,17,21,33 |
| 13 | 14.3 | Partial Derivatives | **14.3:** 10,53,73,**74**, 82 |
| 14 | 14.4 | Tangent Planes | **14.4:** 1,**4**,6 |
| 15 | 14.4 | Linear Approximation | **14.4:** 11,22,31,35 |
| 16 | 14.5 | The Chain Rule | **14.5:** 1,7,**10**,15,21,35 |
| 17 | 14.6 | Directional Derivatives and the Gradient | **14.6:** 1,4,11,17,19 |
| 18 | 14.6 | Directional Derivatives and the Gradient | **14.6:** 21,23,34,41,45, PROOF THM 15 |
| 19 | 14.7 | Maximum and Minimum Values | **14.7:** 3,11,15,41,45,50 |
| 20 | | **REVIEW** | |
| 21 | | **TEST 2** | |
| 22 | 15.1 | Double Integrals over Rectangles | **15.1:** 1,6,11,15,29,**33**,39 |
| 23 | 15.2 | Double Integrals over General Regions | **15.2:** 1,7,17,19,**22**,23,25,26 |
| 24 | 15.2 | Double Integrals over General Regions | **15.2:** **27**,28,30,45,49,51,**52**,61 |
| 25 | 15.3 | Double Integrals in Polar Coordinates | **15.3:** 9,11,12,14,15,19,20 |
| 26 | 15.3 | Double Integrals in Polar Coordinates | **15.3:** 21,22,25,**26**,29,**31** |
| 27 | 15.4 | Applications of Double Integrals | **15.4:** 6,**8**,11,13 |
| 28 | | **REVIEW** | |
| 29 | 15.6 | Triple Integrals | **15.6:** 4,13,14,17,18 |
| 30 | 15.6 | Triple Integrals | **15.6:** 19,21,34,41,42 |
| 31 | 15.7 | Triple Integrals in Cylindrical Coordinates | **15.7:** 1,3,**5**,**6**,**7**,**8**,**11**,17,18 |
| 32 | 15.7/15.8 | Triple Integrals in Cylindrical Coordinates<br>Spherical Coordinates | **15.7:** 19,20,21,23,30<br>**15.8:** 1,**4**,5,**7**,**8**,11,**12** |

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|---|---|---|---|
| 33 | 15.8 | Triple Integrals in Spherical Coordinates | **15.8:** 17,20,23,26,30,35,41 |
| 34 | | **REVIEW** | |
| 35 | | **REVIEW** | |
| 36 | | **TEST 3** | |
| 37 | 16.1 | Vector Fields | **16.1:** 1,5,11,13,15,17,**21**,23 |
| 38 | 16.2 | Line Integrals (of scalar functions) | **16.2:** 3,**6**,11,**12** |
| 39 | 16.2 | Line Integrals (of vector fields) | **16.2:** 13,15,17,22,**27** |
| 40 | 16.2 | Line Integrals (of vector fields) | **16.2:** **28**,39,**40**,41,42 |
| 41 | 16.3 | The Fundamental theorem for Line Integrals | **16.3:** 1,2,3,4,11,13, PROOF THM 2 |
| 42 | 16.3 | The Fundamental theorem for Line Integrals | **16.3:** 15,17,19,23,25,**35** |
| 43 | 16.4 | Green's Theorem | **16.4:** **2**,5,**6**,9,**10**,11,13 |
| 44 | | **REVIEW** | |
| 45 | 16.5 | Curl and Divergence | **16.5**: 1,9,11,12,13,14, PROOF THM 3 |
| 46 | 16.6 | Parametric Surfaces | **16.6:** **4**,5,13,21,23,**24** |
| 47 | 16.6 | Parametric Surfaces | **16.6:** 33,**34**,39,41,45 |
| 48 | 16.7 | Surface Integrals of Scalar Functions | **16.7:** 10,12,**18**,40 |
| 49 | 16.7 | Surface Integrals of Vector Fields | **16.7:** 23,24,26,27 |
| 50 | 16.7 | Surface Integrals of Vector Fields | **16.7:** 29,31 |
| 51 | 16.9 | The Divergence Theorem | **16.9:** 7,**9**,11,**12** |
| 52 | 16.9 | The Divergence Theorem | **16.9:** **13**,17,18 |
| 53 | 16.8 | Stokes' Theorem | **16.8:** **1**,2,3,5 |
| 54 | 16.8 | Stokes' Theorem | **16.8:** 7,9,17,18 |
| 55 | | **REVIEW** | |
| 56 | | **REVIEW** | |
| 57 | | **TEST 4** | |
| 58 | | **COURSE REVIEW** | |
| 59 | | **COURSE REVIEW** | |

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**NOTES:**

1. **Syllabus disclaimer.** This syllabus is a general guideline. The assignments, exam schedule, and policies of your section are determined by your instructor.
2. **Prerequisite.** SM122
3. **Course Outcomes:** At the end of this course students should be able to:
   • describe basic curves and space motion using vector functions and their derivatives and integrals; describe basic surfaces using rectangular, cylindrical, and spherical coordinates; describe basic surfaces using parametrizations
   • find partial derivatives, directional derivatives, and gradient vectors; demonstrate proficiency in relating these to the changes in a function; demonstrate intuitive understanding of the curl, divergence, and the main theorems in vector calculus
   • solve extreme value problems by classification of critical points

• demonstrate proficiency in evaluating double and triple integrals in various coordinate systems; establish connections between density and mass, center of mass; demonstrate proficiency in evaluating line integrals and surface integrals of vector fields and interpreting the results in connection to work, potential, or flux for the field
• write well-organized, coherent solutions to application problems.

4. **WebAssign.** Your instructor may be using the online homework system WebAssign in place of paper submissions. Problems that appear in the syllabus in boldface are not available on WebAssign. Access codes for WebAssign came bundled with your textbook. Consult your instructor for more details.
5. **Proofs.** Three proofs are assigned in the syllabus. At least one of them will be asked for on the final exam. The goal is for students to participate in the rigorous justification of a few mathematical concepts, thereby gaining a better appreciation of that aspect of mathematics and a better understanding of those concepts. The proofs are:
   - Proof of Theorem 15, page 952
   - Proof of Theorem 2, page 1087
   - Proof of Theorem 3, page 1104
6. Students are expected to produce well-written solutions to problems, showing all work in a coherent and logical way. Problems that ask for verbal explanations should be answered with complete sentences.
7. **Calculator.** All students in this course are expected to have the TI-36X Pro calculator. Calculator use may be restricted during portions of the final exam.
8. **Getting Help.** If you would like help in the course, you should contact your instructor for extra-instruction. If your instructor is not available, try the **Math Lab** in CH130. It is staffed all six class periods every class day with instructors who should be able to answer your questions. Also see the Midshipmen Group Study Program (**MGSP**, https://intranet.usna.edu/AcCenter/MGSP/index.php#fndtn-panel1Overview) for group study in the evening led by upper classmen or seek the extra help services provided by the **Center for Academic Excellence** (https://intranet.usna.edu/AcCenter/)
9. **Final Exam** All sections of SM221 will have a common final exam. The day and time of the final exam will be announced around the middle of the semester---don't make travel plans until then. The final exam is cumulative. It typically consists of both multiple-choice and free-response questions. Parts of the final exam allow the use of a calculator, other parts do not. More details about the final exam will be provided by your instructor as the end of the semester approaches. Old final exams and their solutions are available from the department website http://www.usna.edu/MathDept/resources/course-materials.php
10. **Schedule.** Classes on Tuesday, 10 January will follow a Monday schedule. The last day of classes is Tuesday, 2 May. There is a Review & Study day scheduled for Wednesday, 3 May. There are 59 class days in both the MWRF and in the MTWF schedule. The Final Exam period is 4 May – 11 May.