620-231 Vector Calculus

Credit Points:	12.50
Level:	2 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus. Semester 2, - Taught on campus. Lectures and practice classes.
Time Commitment:	Contact Hours: 36 one-hour lectures (three per week), 11 one-hour practice classes (one per week) Total Time Commitment: 120 hours total time commitment
Prerequisites:	*Calculus 2* plus one of # *Linear Algebra* # *Accelerated Mathematics 1* (620-157 Mathematics 1 prior to 2009) **Or** One of # 620-113 (prior to 2008) # 620-123 (prior to 2008) # 620-143 (prior to 2009) # 620-193 (prior to 2006)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students may only gain credit for one of *Multivariable and Vector Calculus*, *Vector Calculus* (620-231 Vector Analysis prior to 2009), 620-233 (prior to 2009).
Core Participation Requirements:	It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact upon their active and safe participation in a subject are encouraged to discuss this with the relevant subject coordinator and the Disability Liaison Unit.
Coordinator:	Dr Richard Brak
Subject Overview:	This subject studies the fundamental concepts of functions of several variables and vector calculus. It develops the manipulation of partial derivatives and vector differential operators. The gradient vector is used to obtain constrained extrema of functions of several variables. Line, surface and volume integrals are evaluated and related by various integral theorems. Vector differential operators are also studied using curvilinear coordinates. Functions of several variables topics include limits, continuity, differentiability, the chain rule, Jacobian, Taylor polynomials and Lagrange multipliers. Vector calculus topics include vector fields, flow lines, curvature, torsion, gradient, divergence, curl and Laplacian. Integrals over paths and surfaces topics include line, surface and volume integrals; change of variables; applications including averages, moments of inertia, centre of mass; Green's theorem, Divergence theorem in the plane, Gauss' divergence theorem, Stokes' theorem; and curvilinear coordinates.
Objectives:	On completion of this subject, the student should : # Understand calculus of functions of several variables; differential operators; line, surface and volume integrals; curvilinear coordinates; integral theorems # Have developed the ability to work with limits and continuity; obtain extrema of functions of several variables; calculate line, surface and volume integrals; work in curvilinear coordinates; apply integral theorems

	# Appreciate the fundamental concepts of vector calculus; the relations between line, surface and volume integrals.
Assessment:	Up to 50 pages of written assignments due during the semester (20%); a 3-hour written examination in the examination period (80%).
Prescribed Texts:	None
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2009/D09)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2009/F04)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2009/A04)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2009/M05)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	In addition to learning specific skills that will assist students in their future careers in science, they will have the opportunity to develop generic skills that will assist them in any future career path. These include # problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies; # analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis; # collaborative skills: the ability to work in a team; # time management skills: the ability to meet regular deadlines while balancing competing commitments.
Notes:	This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BASc or a combined BSc course. Students in the combined degree BE/BSc should note that credit exclusions exist between this subject and Engineering mathematics subjects: 431-201 Engineering Analysis A and 431-202 Engineering Analysis B. Students undertaking this subject will be required to regularly access an internet enabled computer.
Related Course(s):	Bachelor of Engineering (Chemical) and Bachelor of Science Bachelor of Engineering (Computer Engineering)/Bachelor of Science Bachelor of Engineering (Electrical Engineering)/Bachelor of Science
Related Majors/Minors/ Specialisations:	Mathematics & Statistics Major