

Third Semester Calculus at some other institutions

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The mathematics department at UIUC currently offers a basic three semester calculus sequence. The third course is multivariable calculus. Presently, most students take Math 242 as their third course. However, this 3 credit course does not reach the “integral theorems” (in particular Green’s Theorem, Stoke’s Theorem or the Divergence Theorem). The national standard for third semester calculus is quickly becoming a course which includes these results. In fact, the California Articulation agreement has made this the standard since 1995 for even the junior colleges.

CAN: MATH 22

Title: Calculus, 3rd semester

Description: Vector-valued functions; calculus of functions of more than one variable, partial derivatives, multiple integration; Green’s theorem, and the divergence theorem.

The department of mathematics at UIUC has run such a third semester course, Math 243, since the spring of 1998. However, because of the additional material it needs to be offered for 4 credits. The department offers a course, Math 380, which is a fourth semester calculus course for 3 credits which also contains the integral theorems. However, this course has a great deal of overlap with Math 242 and is seen as unnecessarily redundant.

Proposal: The elimination of Math 242 and Math 380. Math 243 will be taught in large lectures 3 days a week with recitations 2 days a week for 4 credits.

The department of mathematics is sympathetic that the additional material may make third semester more difficult for some students. In particular, the additional credit hour is going to cause difficulties for programs (especially in engineering) which already have very few available credits for electives. However, UIUC currently receives one of the lowest number of credits for the three semester calculus sequence. In particular, third semester calculus is essentially always given 4 to 5 semester credit units and the primary difference in some programs (like Michigan State University or MIT) occurs in the first semester calculus course.

Stanford, 13.3 credits, [41, 42, 51, 52 (5, 5, 5, 5) quarter system 13.3 credits]

Berkeley, 12 credits, [1A, 1B, 53 (4, 4, 4)]

University of Michigan, 12 credits, [110, 115, 215 (4, 4, 4)]

Michigan State University, 11 credits, [132, 133, 234 (3, 4, 4)]

Some engineering departments offer the calculus in an accelerated format for fewer credits. For example.

Cal Tech, 9 credits

They receive 27 units over three quarter courses. Full time at Cal Tech is 36 hours so one might divide by 3 to get UIUC equivalent which would be only 9 credits. However, it is taught over one year, not a year and a half. This is because the course begins with a review of calculus and does not assume a student is new to the topic.

Northwestern University, Engineering Sciences and Applied Math, 8 credits

They also offer a three sequence Math 214-1,2,3 for 4,4,4 credits. These are quarter credits so equivalent to 8 semester credits. They, like MIT below, however, do not cover sequences and series and other topics that we do in Math 230.

MIT, 8 credits

They offer several variations but we will stick to their primary sequence. Math 18.01 is offered for the equivalent of 4 semester credits and is their first calculus course. Their second semester course is Math 18.02 and also offered for the equivalent of 4 semester credit hours.

MATH 18.02

Prereq: 18.01

Units: 5-0-7 (12 total, 3 units = 1 semester credit)

Description: Double integrals and line integrals in the plane; exact differentials and conservative fields; Green's theorem and applications, triple integrals, line and surface integrals in space, Divergence theorem, Stokes' theorem; applications.

A comparison of their Math 18.01 with our Math 220, 230 courses is as follows:

topic	# lec. MIT	# lec. UIUC
derivatives and applications	14	23
integrations and applications	7	14
techniques of integration	4	6
polar coordinates and integration	3	7
infinite series, Taylor's	2	10
Total Lectures	30	60