

WINONA STATE UNIVERSITY REQUIRED CHECKLIST FOR ALL CURRICULAR PROPOSALS

Course or Program MATH 270

This checklist enables A2C2 representatives to endorse that their departments have accurately followed the Process for Accomplishing Curricular Change. For each course or program proposal submitted to A2C2, this checklist must be completed, signed by the submitting department's A2C2 representative, and included with the proposal when forwarded for approval. Peer review of proposals is also strongly advised, e.g., departments should discuss and vote on the proposals *as submitted to A2C2*, rather than on just the ideas proposed or drafts of proposals.

If a proposal fails to follow or complete any aspect of the process, the Course and Program Proposal Subcommittee will postpone consideration of the proposal and return it to the department's A2C2 representative for completion and resubmission. Resubmitted proposals have the same status as newly submitted proposals.

Note: This form need not be completed for notifications.

1. The appropriate forms and the "Approval Form" have been completed in full for this proposal. All necessary or relevant descriptions, rationales, and notifications have been provided.
 Completed

- 2a. The "Financial and Staffing Data Sheet" has been completed and is enclosed in this proposal, if applicable.
 Completed NA

- 2b. For departments that have claimed that "existing staff" would be teaching the course proposed, an explanation has been enclosed in this proposal as to how existing staff will do this, e.g., what enrollment limits can be accommodated by existing staff. If no such explanation is enclosed, the department's representative is prepared to address A2C2's questions on this matter.
 Completed NA

3. Arrangements have been made so that a department representative knowledgeable of this proposal will be attending both the Course and Program Proposal Subcommittee meeting and the full A2C2 meeting at which this proposal is considered.
 Completed
 Name and office phone number of proposal's representative: _____

4. Reasonable attempts have been made to notify and reach agreements with all university units affected by this proposal. Units still opposing a proposal must submit their objections in writing before or during the Course and Program Proposal Subcommittee meeting at which this proposal is considered.
 Completed NA

5. The course name and number is listed for each prerequisite involved in this proposal.
 Completed NA

6. In this proposal for a new or revised program (major, minor, concentration, etc.), the list of prerequisites provided includes all the prerequisites of any proposed prerequisites. All such prerequisites of prerequisites are included in the total credit hour calculations. Completed NA

7. In this proposal for a new or revised program, the following information for each required or elective course is provided:
 - a. The course name and number.
 - b. A brief course description.
 - c. A brief statement explaining why the program should include the course. Completed NA

8. This course or program revision proposal:
 - a. Clearly identifies each proposed change.
 - b. Displays the current requirements next to the proposed new requirements, for clear, easy comparison. Completed NA

9. This course proposal provides publication dates for all works listed as course textbooks or references using a standard form of citation. Accessibility of the cited publications for use in this proposed course has been confirmed.
 Completed NA

Department's A2C2 Representative or Alternate

Date

WINONA STATE UNIVERSITY
NEW AND REVISED COURSE AND PROGRAM APPROVAL FORM

Routing form for new and revised courses and programs.

Course or Program MATH 270

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|
| Department Recommendation | | |
| _____ Department Chair | _____ Date | _____ e-mail address |
| Dean's Recommendation ____ Yes ____ No* | | |
| _____ Dean of College | _____ Date | |
| *The dean shall forward their recommendation to the chair of the department, the chair of A2C2, and the Vice President for Academic Affairs. | | |
| A2C2 Recommendation ____ Approved ____ Disapproved | | |
| _____ Chair of A2C2 | _____ Date | |
| Graduate Council Recommendation ____ Approved ____ Disapproved (if applicable) | | |
| _____ Chair of Graduate Council | _____ Date | |
| _____ Director of Graduate Studies | _____ Date | |
| Faculty Senate Recommendation ____ Approved ____ Disapproved | | |
| _____ President of Faculty Senate | _____ Date | |
| Academic Vice President Recommendation ____ Approved ____ Disapproved | | |
| _____ Academic Vice President | _____ Date | |
| Decision of President ____ Approved ____ Disapproved | | |
| _____ President | _____ Date | |
| Please forward to Registrar. | | |
| Registrar | _____ Date entered | Please notify department chair via e-mail that curricular change has been recorded. |

WINONA STATE UNIVERSITY PROPOSAL FOR REVISED COURSES

Department Mathematics and Statistics

Date 2/11/2011

If proposed course change requires A2C2 and/or graduate Council approval, i.e., not considered a notification, complete and submit this form with the appropriate number of copies. Refer to Regulation 3-4, **Policy for Changing the Curriculum**, for complete information on submitting proposals for curricular changes.

Current Course Information

MATH 270 Differential Equations & Linear Algebra 4
 Course No. Course Title Credits

This Proposal is for a(n) Undergraduate Course Graduate Course

Applies to: Major Minor University Studies
 Required Required Not for USP
 Elective Elective

Prerequisites MATH 165

Grading Grade only P/NC only Grade and P/NC Option

Frequency of offering Each Semester

Proposed Course Information. (Please indicate only proposed changes below.)

Course No. Course Title Credits 3

This Proposal is for a(n) Undergraduate Course Graduate Course

Applies to Major Minor University Studies
 Required Required Not for USP
 Elective Elective

Prerequisites _____

Grading Grade only P/NC only Grade and P/NC Option

Frequency of offering _____

A. Changes in the course description. SEE ATTACHED

1. Catalog description (include a display of current and proposed course requirements).
2. Course outline of the major topics and subtopics (minimum of two-level outline).
- 3.a Instructional delivery methods utilized: (Please check all that apply).

| | | | | |
|--------------------------------------------------------|-------------------------------------------|---------------------------------------|--------------------------------------------------|------------------------------------------------------|
| Lecture: Auditorium | <input checked="" type="checkbox"/> ITV | Online | <input checked="" type="checkbox"/> Web Enhanced | <input checked="" type="checkbox"/> Web Supplemented |
| Lecture: <input checked="" type="checkbox"/> Classroom | <input type="checkbox"/> Service Learning | <input type="checkbox"/> Travel Study | <input type="checkbox"/> Laboratory | <input type="checkbox"/> Internship/Practicum |
| Other: (Please indicate) _____ | | | | |

- 3.b. MnSCU Course media codes: (Please check all that apply).

| | | | |
|---------------------------------------|----------------------------------------------------|-----------------------------------------------|----------------------------------------------------------|
| None: | <input type="checkbox"/> 3. Internet | <input type="checkbox"/> 6. Independent Study | <input checked="" type="checkbox"/> 9. Web Enhanced |
| <input type="checkbox"/> 1. Satellite | <input checked="" type="checkbox"/> 4. ITV Sending | <input type="checkbox"/> 7. Taped | <input checked="" type="checkbox"/> 10. Web Supplemented |
| <input type="checkbox"/> 2. CD Rom | <input type="checkbox"/> 5. Broadcast TV | <input type="checkbox"/> 8. ITV Receiving | |

4. Course requirements (papers, lab work, projects, etc.) and means of evaluation.

B. Rationale for each of the changes proposed.

C. Impact of this Course on other Departments, Programs, Majors, or Minors

1. Does this course increase or decrease the total credits required by a major or minor of any other department? If so, which department(s)?
2. List the department(s), if any, which have been consulted about this proposal.

D. Describe impacts of this proposal on the University Studies Program.

Definitions:

01-Satellite:

02- CD Rom:

03- Internet: Predominately = where all, or nearly all, course activity occurs in an online environment. One to two activities may occur face-to-face in a classroom, with the maximum being two activities.

04 – ITV Sending: a course in which students are in the classroom with the instructor, other students join via interactive television technology from other geographically separate locations

05 – Broadcast TV:

06 – Independent Study: a course in which the teacher develops specialized curriculum for the student(s) based on department guidelines in the University course catalog

07 – Taped: a course in which the teacher records the lessons for playback at a later date

08 – ITV Receiving: a course in which students are not in the classroom with the teacher, other students join via interactive television technology from other geographically separate locations

09 – Web Enhanced- Limited Seat Time: For a course in which students are geographically separate from the teacher and other students for a majority of required activities. However, some on-site attendance is required. The course includes synchronous and/or asynchronous instruction.

10 – Web Supplemented- No Reduced Seat Time: For a course utilizing the web for instructional activities. Use of this code may assist your college/university in tracking courses for “smart classrooms” and/or facility usage.

Attach an **Approval Form** with appropriate signatures.

Department Contact Person for this Proposal:

| | | |
|---------------------|-----------------|---------------------------|
| <u>Barry Peratt</u> | <u>457-5567</u> | <u>bperatt@winona.edu</u> |
| Name (please print) | Phone | e-mail address |

WINONA STATE UNIVERSITY
FINANCIAL AND STAFFING DATA SHEET

Course or Program MATH 270

Include a Financial and Staffing Data Sheet with any proposal for a new course, new program, or revised program.

Please answer the following questions completely. Provide supporting data.

1. Would this course or program be taught with existing staff or with new or additional staff? If this course would be taught by adjunct faculty, include a rationale.

This course would be taught by existing faculty.

2. What impact would approval of this course/program have on current course offerings? Please discuss number of sections of current offerings, dropping of courses, etc.

As described in the proposal, this revised MATH 270 (3 S.H.) course, along with the proposed new offering MATH 271 (1 S.H.), would replace in content and faculty load our current MATH 270 (4 S.H.) course.

3. What effect would approval of this course/program have on the department supplies? Include data to support expenditures for staffing, equipment, supplies, instructional resources, etc.

As described above, the demand for these resources would not change.

A2C2 Proposed Change for MATH 270 Spring 2011

A. Catalog Changes

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>270 - Differential Equations and Linear Algebra (4 S.H.) Solution techniques for ordinary differential equations including boundary/initial value problems and systems of first-order equations. Topics include linear homogeneous and non-homogeneous differential equations and the Laplace transform. Methods of linear algebra are studied as they apply to the solution of differential equations. Prerequisite: MATH 165.</p> | <p>270 - Differential Equations (3 S.H.) Solution techniques for ordinary differential equations including boundary/initial value problems and systems of first-order equations. Topics include linear homogeneous and non-homogeneous differential equations, the Laplace transform, and systems of differential equations. Prerequisite: MATH 165 and either MATH 205 OR concurrent enrollment in MATH 271.</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The rest of the information for this section is contained in the attached course outline.

B. Rationale for reducing MATH 270 from 4 credits to 3 credits.

The main reason for the reduction in the number of credits of MATH 270 from 4 credits to 3 credits is that the Mathematics and Statistics Department wishes to treat the Linear Algebra component of this course in a separate (more rigorous) course for students majoring in mathematics, statistics, or mathematics education. The Linear Algebra component in MATH 270 was originally included to insure that Mathematics and Statistics majors who take the class had some exposure to introductory Linear Algebra. (Linear Algebra currently comprises 25% of the course material in MATH 270.) The Linear Algebra component can be taken out of MATH 270 without any detriment to the rest of the course. Differential Equations and Linear Algebra are traditionally separate courses in other universities and colleges. The Mathematics and Statistics Department wishes to conform to this norm.

C. The Impact of This Course on Other Departments, Programs, Majors and Minors

The proposed reduction in the number of credits will create a deficit of 1 credit of Linear Algebra for non-math majors taking Differential Equations (primarily Engineering students). For those who take MATH 205 this is not a problem, but to recoup this deficit for those not taking MATH 205, the Mathematics and Statistics Department is filing an accompanying proposal for the creation of a separate MATH 271 course called Linear Algebra for Differential Equations, which will run concurrently with MATH 270 and be taught by the same instructor that is teaching MATH 270. The following table shows that taking MATH 270 and MATH 271 in the same semester is equivalent in credits as taking MATH 270 currently.

| Current Requirement for Engineering and Physics | Future Requirement for Engineering and Physics |
|-------------------------------------------------|-----------------------------------------------------------------------|
| MATH 270 (4 credits) | MATH 270 (3 credits - proposed) and MATH 271 (1 credit - proposed) |

Students majoring in Mathematics and Statistics already take either MATH 130 (Matrix Algebra - 3 credits) or MATH 270 (4 credits). A major allowed to graduate with MATH 130 will have the

same number of credits someone who takes MATH 270 at 3 credits. Hence, the credit requirement in order to complete Mathematics and Statistics degrees will not be affected.

The Mathematics and Statistics Department has consulted the Department of Engineering regarding this proposed change, and the new joint offering of MATH 270 and 271 will create no increase or decrease in the number of credits required for their majors.

D. The Impact of This Course Change on the University Studies Program

Currently, MATH 270 satisfies a Math/Stat/Critical Analysis Flag. The material in this course which qualifies it thus does not substantially change; it merely comprises fewer credit hours.

WINONA STATE UNIVERSITY
COLLEGE OF SCIENCE AND ENGINEERING
DEPARTMENT OF MATHEMATICS AND STATISTICS

Course Outline-MATH 270

Course Title: Differential Equations

Current Catalog Description: **Differential Equations (4 S.H.)** - Solution techniques for ordinary differential equations including boundary/initial value problems and systems of first-order equations. Topics include linear homogeneous and non-homogeneous differential equations and the Laplace transform. Prerequisite: MATH 165.

Suggested Catalog Description: **Differential Equations (3 S.H.)** - Solution techniques for ordinary differential equations including boundary/initial value problems and systems of first-order equations. Topics include linear homogeneous and non-homogeneous differential equations, the Laplace transform, and systems of differential equations. Prerequisite: MATH 165 and either MATH 205 OR concurrent enrollment in MATH 271.

Number of Credits: 3

Text: Possible texts include *Differential Equations & Linear Algebra* by Edwards & Penny, *Differential Equations: Matrices and Models* by Bugl, and *Differential Equations & Linear Algebra* by Greenberg.

Topics Covered:

- Differential Equations and Modeling.
- First-Order Differential Equations
 - Type of equations: autonomous, non-autonomous, linear, non-linear, separable.
 - Techniques for analyzing: existence/uniqueness theorem, slope fields, phase plots, numerical integration, separation of variables, integrating factors.
 - Bifurcations
- ~~Linear Algebra~~
 - ~~Solving simultaneous linear equations.~~
 - ~~The inverse of a matrix and reduced row echelon form.~~
 - ~~Vector spaces, linear independence, spanning, bases.~~
 - ~~Linear Transformations~~
 - ~~Eigenvalues and Jordan Canonical Form~~
- First Order Systems of Differential Equations
 - Modeling with systems.
 - Euler's Method with systems.

- Linear systems and eigenvalue analysis.
- Converting second order equations to systems.
- Forcing and non-autonomous systems.
- Non-linear systems, linearization, series solutions.
- Series Solutions.
- LaPlace Transforms.

The following University Studies language is required to appear on each instructor's syllabus for the course:

University Studies Math/Stat Flag: This is a University Studies course that satisfies the Math/Stat Flag requirement. Mathematics 270 contains requirements and learning activities that promote students' abilities to:

- a. practice the correct application of mathematical or statistical models that are appropriate to their prerequisite knowledge of those areas; and
- b. make proper use of modern mathematical or statistical methods appropriate to their level of prerequisite knowledge, to include, if statistics is used in a substantive way, the use of a statistical package with graphics capability when appropriate.

Relation of Topics Covered to Basic Skills: In the description of class topics and requirements below, these objectives in this list are referred to by **a-b**.

- Differential Equations and Modeling. **a-b**.
- First-Order Differential Equations
 - Type of equations: autonomous, non-autonomous, linear, non-linear, separable. **a-b**.
 - Techniques for analyzing: existence/uniqueness theorem, slope fields, phase plots, numerical integration, separation of variables, integrating factors. **a-b**.
 - Bifurcations **a-b**.
- First Order Systems of Differential Equations
 - Modeling with systems. **a-b**.
 - Euler's Method with systems. **a-b**.
 - Linear systems and eigenvalue analysis. **a-b**.
 - Converting second order equations to systems. **a-b**.
 - Forcing and non-autonomous systems. **a-b**.
 - Non-linear systems, linearization, series solutions. **a-b**.
- Series Solutions. **a-b**.
- LaPlace Transforms. **a-b**.

Listing of Sections to be Covered: Not applicable to this course, since there is no standard textbook. Chosen sections of any text should correspond to the topics outlined above.

Remarks: None.

Method of Instruction: Lecture-presentation, discussion, question-answer sessions, use of calculators/computers, group work.

Evaluation Procedure: Homework, quizzes, projects, midterm exams, and a final exam.

Last Revised: February 2011 by the Mathematics Subgroup