New Undergraduate Course Approval Cover Form
Montana State University

This four-page form collects basic information about the proposed new course, provides information on the approval process, and includes all required approvals. Additional information (see INFO sheet) is also required as part of the New Course Packet.

Proposed New Course Information

Requested Rubric, Course Number, Core Designation (if needed):
Example: PHL 361 RH

Course Title: MANAGERIAL FORECASTING & DECISION ANALYSIS
Abbreviated Course Title (≤30 chars): MGR FORECAST & DECISION ANLYS
First Semester to be Offered: Fall 2015
Submitted by: Durward K. Sobek II
x7140  dsobek@ie.montana.edu
Submitter's Contact Info: Phone, Email:
Instructor: William Schell
Department: Mechanical and Industrial Engineering
College: COE

New Course Review Process

Instructor completes the New Course Packet, with Core information if a Core designation is requested.

Instructor checks for “equivalent” coursework in the MUS system and recommends a common or unique course number.

Department Head's signature indicates that course has been approved by the process used within the Department.

The Chair of the College Curriculum Committee signs to indicate college academic approval.

The College Dean signs to indicate that adequate resources are available to offer the course. Supporting information (Dean's Statement) is typically required.

The New Course Packet (as PDF) is uploaded to the Provost's Office server for distribution to other committees.

Course requests are sent to Curriculum and Program Committee (CPC). Core reviews are sent to appropriate Core subcommittee. Committees work in parallel when possible to speed approval process. Special topics courses (291, 491) skip the CPC review (limited to two years).

Provost's Office reviews the new course request. New courses are submitted to MUS for Common Course Number (CCN) review. Dean and Department informed upon approval.

Approved new course sent to Registrar for inclusion in the Catalog and Schedule of Classes

APPROVALS

Durward K. Sobek II
Submitter *
Ruhul Amin
Department Head *
Christine M. Foreman
Dean *

Date
12/20/2013
1/15/2014
12/10/2013

Chair, College Curriculum Comm.
Chair, Core Subcommittee (if any)
Chair, CPC
Assoc. Provost *

Date
Date
Date
Date

Note: This diagram illustrates the typical flow path, but at any review step there can be a request for additional information or modifications. Careful review in early steps is the best way to speed the overall process. * Special topics courses (291, 491) require fewer signatures, but cannot be offered more than two times without committee review.
 INFORMATION NEEDED FOR COMMON COURSE NUMBERING

The process for identifying a common course number for a new course is as follows:

1. Course learning outcomes are prepared for the new course.
2. The person submitting the new course request looks at the CCN website to see if a course with similar outcomes already exists in the MUS system.
   
   www.mus.edu/Qtools/CCN/ccn_default.asp
   
   - If a course exists with at least 80% of the same outcomes, the course is considered "equivalent" to the proposed new course, and the new course should use the existing rubric and course number.
   - If no "equivalent" course is found, the person submitting the new course request should identify a unique course number that has not been used by any other course in the MUS system.
3. The requested rubric and course number are submitted as part of the new course packet.
4. The Provost's Office submits the learning outcomes and the requested rubric and course number to the MUS to have a course number assigned to the course. (This will typically be the requested course number, but it could be changed.)
5. The assigned common course number is reported back to the person submitting the new course request.

Requested Rubric, Course Number, Core Designation (if needed):

   Course Title:
   Abbrev. Course Title (≤ 30 char):
   Credits:
   Department Offering Course:
   College:

Is this course "equivalent" to a course in the MUS System?:

Learning Outcomes for the Course:

1. Describe how forecasting tools are used to solve engineering problems in the financial and big data domains.

2. Select and apply the proper forecasting tool to generate useful models for a variety of data sets.

3. Utilize a variety of forecasting tools to solve engineering problems with a focus on financial applications.

4. Judge the effectiveness of forecasting models and assess model adequacy.

5. Evaluate the risks in a forecasting model and develop plans to deal with this uncertainty.

6. Explain the best way to organize a forecasting process for a variety of business applications.
INFORMATION REQUIRED BY THE REGISTRAR

The data needed to enter the new course into the MSU Catalog and Schedule of Classes is collected on this page. Once the new course has been approved, this page is automatically forwarded to the Registrar for data entry.

Assigned Rubric, Course Number, Core Designation (if needed):

Course Title (for Catalog):

Course Title (for Schedule of Classes, 30 characters, max.):

First Semester to be Offered:

Restricted Entry/Consent of Instructor Required:

Instructor’s GID (last 4 digits only):

Department Offering Course:

College:

Is the requested course number available? (x4155 to check):

Frequency of course offering:

Semester(s) offered (check all that apply): Summer

Summer Options (check all that apply):

Credits by mode of instruction:

Lecture:

Seminar:

Independent Study:

Lab/Studio:

Recitation/Discussion:

TOTAL CREDITS:

Primary Mode(s) of Delivery:

Face-to-face

Web-Enhanced (small on-line comp.)

On-Line Only

Blended (significant on-line portion)

Time and Location – Call the Registrar’s Office at x4155 to find a time and location for the course.

Assigned Day(s):

Assigned Time(s):

Assigned Building:

Assigned Room:

Capacity (room capacity, or enrollment “cap”):

Co- and Pre-Requisites – Courses numbered 200 and above are normally expected to have prerequisites. When listing multiple prerequisites, please separate courses with “and” if both are required, or “or” if only one is required.

Prerequisite(s):

Co-Requisite(s):

Course Description – Provide a course description of 40 words or less for the MSU Catalog.

Time series analysis through classical approaches: auto-regression, smoothing models, and advanced time series models. Technical applications emphasized. Includes investigations into financial and dependent data. Approaches designed for managers to test real
DEAN’S STATEMENT

The reviewing committees are being asked to take a closer look at the resources required for each proposed new course. In many cases new courses will replace existing courses and the new course request is effectively resource neutral, however that is not always the case. For example, a new elective course that would result in distributing an existing student population across a larger number of courses would represent a significant increase in expenditures for the new course, and no increase in total student credit hours. A funding mechanism for such a course would need to be identified. The Dean’s Statement is the place to document how the costs of the proposed new course will be covered.

The Financial Engineering program was recently (September 2013) approved by the Board of Regents. The new program will be managed jointly by departments in two colleges: the Department of Mechanical and Industrial Engineering in the College of Engineering and the Department of Agricultural Economics and Economics in the College of Agriculture. This course, Managerial Forecasting and Decision Analysis—EIND 468, is part of the new program and will be co-convened with the graduate level course EIND 558. Please see the Dean’s statement from the College of Engineering, November 8, 2013—"As Acting Dean of the College Engineering, I fully support approval of EFIN 499 and EIND 468 as new courses. These courses are integral to the development and growth of the new Financial Engineering program. The College of Engineering will financially support the initial development of these courses. The steady state cost of offering will be justified through growth of the Financial Engineering program and accompanied resources. These resources will either be reallocated Industrial Engineering resources or possibly new resources obtained through the normal college or university resource distribution processes."
New Undergraduate Course Narrative
Montana State University
Updated August 23, 2012

Please provide the following information in narrative format. Substantive responses to all criteria are required. Although not required, a draft syllabus can also be helpful to the committee in understanding the details of the proposed course.

General Course Information
1. Requested Rubric, Course Number, and Core Designation (if any)
   
   EIND 468

2. Course Title
   
   Managerial Forecasting & Decision Analysis

3. Provide a general description of the course explaining the need for the course, its goals, and its overall structure. This is the most important part of the application and should offer a good sense of what students will experience by taking this class.
   
   This is a new undergraduate offering to be co-convened with an existing graduate offering (EIND 558) in the Industrial Engineering program. It is one component of the new undergraduate program in Financial Engineering recently approved by the Board of Regents. The course will cover a variety of traditional forecasting and data analysis tools with a heavy focus on hands-on applications for students. These applications will be completed using real-world data sets in small groups in an active learning setting.

4. Based on what types of student work (e.g., tests, homework assignments, papers, performances, etc.) will grades be determined?

   The course requirements as outlined in the attached syllabus are as follows:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
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</table>

    Regular individual assignments.

    Three full period exams
5. Provide a course content outline containing all major topics plus a brief description of the material to be covered under each major topic heading.

1. Understanding Managerial Applications of Forecasting
   a. What makes a good forecast?
   b. What period should a forecast cover?
   c. What is the best way to produce a forecast?
   d. How can you avoid gaming and other forms of data manipulation?
   e. How should a forecast be used?
   f. How do you ensure that your forecast is reliable?
   g. How accurate does it need to be?
   h. How should you deal with risk and uncertainty
   i. What is the best way to organize a forecast process?
   j. What changes should be made to other performance management processes to facilitate good forecasting?

2. Fundamental Concepts (including computer applications)
   a. Stochastic Processes
   b. The Autocovariance and Autocorrelation Functions
   c. Moving Average and Autoregressive Representations of Time Series Processes

3. Stationary Time Series Models
   a. Autoregressive Processes
   b. Moving Average Processes
   c. Autoregressive Moving Average ARMA(p, q) Processes

4. Nonstationary Time Series Models
   a. Nonstationarity in the Mean
   b. Autoregressive Integrated Moving Average (ARIMA) Models
   c. Nonstationarity in the Variance and the Autocovariance

5. Forecasting
   a. Minimum Mean Square Error Forecasts
   b. Computation of Forecasts
   c. The ARIMA Forecast as a Weighted Average of Previous Observations
   d. Updating Forecasts

6. Model Identification

7. Parameter Estimation, Diagnostic Checking, and Model Selection
   a. The Method of Moments
   b. Maximum Likelihood Method
   c. Nonlinear Estimation

8. Seasonal Time Series Models

9. List required texts or other required references.

Per the attached syllabus:
Optional - Predictive Analytics: Microsoft Excel. Carlberg.
10. What are the estimated enrollment and student credit hour (SCH) production? [SCH = (enrollment * credits)]

Enrollment = 30; SCH = 90

11. Will there be an enrollment cap that restricts enrollment below the level of student demand? If so, what is the enrollment cap and why is it necessary?

No

12. Will course be a "restricted enrollment" course? If so, why is restricted enrollment necessary?

No.

13. Describe how the success of the course will be evaluated? ("End-of-semester student evaluations" is not the answer to this question. How will the instructor determine if the learning outcomes are being met, and how will the department determine if the course is fulfilling its intended purpose?)

Student enrollment, accreditation review, financial engineering internal and external advisory committees, student and industry feedback.

14. Is the instructor a member of the regular faculty (i.e., tenured or tenure-track)? If no, please describe the instructor’s qualifications, attach a Vita, and provide a separate letter of support, signed by the department head (or appropriate unit director), addressing the instructor’s qualifications to teach this course.

Regular tenure-track faculty member.

Level of Offering

15. Has the course been offered previously under 280/291 or 480/491? If so, when? Under what number? What was the enrollment? What level of students took the course?

Yes, the graduate offering of the course was last offered in Spring 2006 with an enrollment of 9 students (S04 = 13). The addition of the undergraduate Financial Engineering students and growth in the IE graduate program since 2006 are expected to bring the enrollment to the estimated number of students provided previously.

16. Justify the level of course offering.

Complex mathematical and statistical material typically only offered at the senior or graduate level within engineering, and statistics programs. This builds on the statistical techniques in the pre-requisite EIND 354 course similar to other co-convened course offerings in the Industrial Engineering program. The course is expected to be completed during students' senior year in the new Financial Engineering major.
Relationship to other Courses, Curricula, and Departments

17. Does this course build on or interrelate with other courses in your curriculum or related curricula? If so, which ones?

Yes; Course builds on the material covered in EIND 354, which is a junior level course with 200-level math courses as prerequisites.

18. Do the topics in the proposed course duplicate or reiterate those in other courses in this or any other department? If so, how do the coverage and educational experience differ and how is this duplication or reiteration justified? Also, what liaison (which is expected in cases of apparent overlap) has been conducted with other departments? Report reactions, both favorable and unfavorable.

The course has some topical overlap with STAT 436 | 536. While this overlap includes the general mathematical topics covered, the natures of the courses are materially different. The existing STAT course focuses on modeling methods within forecasting as opposed to forecasting methods. The proposed course has a specific applications focus, with a managerial emphasis supported through use of the Future Ready text. In addition, the new course utilizes commonly adapted business software programs including Excel and Minitab. The current STAT offering utilizes R software common in that discipline. Finally, the STAT course is offered only in alternate years and has a greater level of pre-requisites than the proposed course. Discussion with Mark Greenwood in the math department to review the course and co-convene offering established agreement that the engineering course is substantively different in its coverage, consistent with existing practice of offering statistics courses both in math and engineering. The proposed major in financial engineering, including proposed courses, has been reviewed and approved by Faculty Senate.

19. What programs (departments, colleges) will be impacted by the SCH production of this course? That is, where do you think the SCH in the proposed course are likely to come from? If the expected SCH production of the proposed course is greater than 1000, and the SCH are expected to come from other colleges, what steps have been taken to make the other units aware of the potential loss of SCH? Report reactions, both favorable and unfavorable.

The financial engineering major is offered jointly by the Department of Agricultural Economics and Economics and the Department of Mechanical and Industrial Engineering; both departments will be sources of the SCH for this major, along with new students.

20. If this proposed course has a significant interdisciplinary component, please explain briefly. Otherwise, indicate n/a.

This course is at the crossroads of economics, statistics and engineering. The principles of forecasting analyzed in this course are constructed by blending the systems modeling approaches of industrial/systems engineering and statistics as applied primarily to the financial engineering domain.
Students Served
21. Does the proposed course serve majors only? Non-majors only? Both majors and non-majors? What other majors might be interested in this course? State areas or disciplines to be served and indicate the specific efforts that will be made to make the course material relevant to all disciplines served.

Predominantly majors and minors in Financial Engineering and graduate students in Industrial & Management Engineering. Some students from other fields such as economics, agricultural business, business, and other engineering disciplines may periodically enroll.

Resources
22. What additional resources (e.g., additional instructional FTE, required technologies), if any, will be required to offer this course? Are there any resource issues for the students who will take the course (e.g., required technologies, travel, on-line access requirements)? Will there be an additional fee charged to students taking this course? Please explain.

Incremental instructional resources are needed in Industrial Engineering. The Dean of the College of Engineering committed the needed non-tenure track support to cover other EIND courses as part of the approval of the new undergraduate degree in Financial Engineering.

23. What existing information resources – print (books, journals, documents), audiovisual (videos, DVDs, CDs or other), and/or electronic (e-books, databases, electronic journals and web sites) – provided by the MSU Libraries will be used by students in this course? Provide examples as well as descriptive information. If additional information resources are necessary, please discuss those acquisitions with the library (x6549 Collection Development) at least three months prior to the beginning of the semester in which this course will be taught.

No additional information resources are necessary.

Other Supporting Material
24. Include any additional information you feel is needed to support this request.

The course was part of the proposal for a new degree program which was discussed widely with the Colleges of L&S, Ag, Engineering and Business; and was vetted through Faculty Senate before reaching the Board of Regents. See the attached BOR application for the financial engineering major.
Fall 2015
EIND 468 | 558 – Managerial Forecasting & Decision Analysis

Instructor: William Schell, PhD, PE
Office Hours: Roberts Hall 403, times TBD and by request
Contact: wscnell@ie.montana.edu, 406.994.5938 (office), 406.224.0857 (cell / text)

General Course Information
Website: http://www.coe.montana.edu/ie/faculty/schell/teaching/eind468/
Meeting Time: TBD
Meeting Location: TBD
Description: Time series analysis through classical approaches including regression, smoothing models, and advanced time series models. Technical applications emphasized in concepts, tools, and methods. Includes investigations into financial and dependent data. Approaches designed for managers to test real applications for making decisions.
Prerequisites: EIND 354
Optional - Predictive Analytics: Microsoft Excel. Carlberg.

Etiquette and Attendance: All members of the class are expected to conduct themselves professionally at all times. Key components of professional behavior include arriving on time, engaging in course discussions, and not adding distractions to class. Class attendance is not mandatory, however, class members are expected to be present when attending and are expected to know all course materials regardless of attendance. MSU Student Conduct Guidelines can be found at www2.montana.edu/policy/studentconduct

Learning Outcomes: At the end of this course the students will be able to:

1. Describe how forecasting tools are used to solve engineering problems in the financial and big data domains.
2. Select and apply the proper forecasting tool to generate useful models for a variety of data sets.
3. Utilize a variety of forecasting tools to solve engineering problems with a focus on financial applications.
4. Judge the effectiveness of forecasting models and assess model adequacy.
5. Evaluate the risks in a forecasting model and develop plans to deal with this uncertainty.
6. Explain the best way to organize a forecasting process for a variety of business applications.

Students will gain hands on experience in these techniques through team based problems.
Grading and Evaluation

Grading Scale: Grades will be earned based on performance against the following cut offs:

- A: 92
- A-: 90
- B+: 88
- B: 82
- B-: 80
- C+: 78
- C: 72
- C-: 70
- D+: 68
- D: 60
- F: Below 60

Graded Assignments: The final course grade will be earned through performance on the following set of assignments:

<table>
<thead>
<tr>
<th></th>
<th>468</th>
<th>558²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
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1 - The grading scale presented above represents the guaranteed grade a student will earn if these performance levels are met. Final grades may be curved, or additional opportunities to earn course points presented, if determined necessary by the instructor.

2 - While the course is co-convened with both undergraduate and graduate sections, it is not the same course. Expectations will be higher for graduate students, notably on the course project and certain exam questions. Students with concerns about these differences should meet with the instructor.

3 - If at any time during the semester there is evidence of a student cheating on homework by using the instructor’s manual or any other way, the minimum action taken is that they will earn a 0 on the entire homework portion of their course grade. MSU Student Conduct Guidelines, including specific policies on academic integrity can be found at www2.montana.edu/policy/studentconduct

Late Assignments: Homework is due at the beginning of the class period after it was assigned. Late assignments will be accepted up until the next class period begins, but will be penalized 20%. Exams must be taken during the scheduled time period. Make up exams are allowed only for unanticipated and approved absences.

Exams: Students will generally have the entire period to complete exams. Students may utilize a hand written single side of one 8.5 x 11” sheet of paper for each exam, and any non-communicating calculator of their choosing (unless otherwise noted). The final exam will be comprehensive in nature and will take place during the assigned exam period. Students may utilize both sides of two hand written 8/5 x 11” sheets for the final.

Grade Corrections: Adjustments will be made to the score of a graded assignment only when a grading error has been made. If the student believes an error was made in grading, the written request for correction must be made within 24 hours of the assignment being returned and include the original graded material.

Course Communications
Assignments and other key information regarding this course will be published to the course website. The course listserv will be utilized for any reminders, and/or to draw student's attention to any new materials (e.g. corrections) published to the website.