NEW COURSE PROPOSAL

College: [Engineering and Computer Science] **Department: [Mechanical Engineering]**

Note: Use this form to request a single course that can be offered independently of any other course, lab or activity.

1. **Course information for Catalog Entry**
   Subject Abbreviation and Number: **[ME 475]**
   Course Title: **[Heat Transfer II]**
   Units: **[3]** units
   Course Prerequisites: **[ME 375; ME 390; ME 280 or MATH 280 or ECE 280.]** *(if any)*
   Course Corequisites: **[ ]** *(if any)*
   Recommended Preparatory Courses: **[ ]** *(if any)*

2. **Course Description for Printed Catalog:** *Notes:* If grading is NC/CR only, please state in course description. If a course numbered less than 500 is available for graduate credit, please state "Available for graduate credit in the catalog description."

   [Prerequisites: ME 375; ME 390; ME 280 or MATH 280 or ECE 280. Intermediate topics on conduction, convection, radiation heat transfer. Introductions to heat exchangers, simultaneous heat and mass transfer and phase change. Applications to design. **]**

3. **Date of Proposed Implementation: (Semester/Year): [Fall] / [2016]** *Comments*

4. **Course Level**
   [X]Undergraduate Only **[]**Graduate Only **[]**Graduate/Undergraduate

5. **Course Abbreviation "Short title" (maximum of 17 characters and spaces)**
   Short Title: **[H•E•A•T• •T•R•A•N•S•F•E•R• •I•I•]**

6. **Basis of Grading:**
   []Credit/No Credit Only **[X]Letter Grade Only** **[]CR/NC or Letter Grade**

7. **Number of times a course may be taken:**
   [X] May be taken for credit for a total of **[1]** times, or for a maximum of **[3]** units
   [ ] Multiple enrollments are allowed within a semester

8. **C-Classification:** *(e.g., Lecture-discussion (C-4).)*
   [3] units @ **[C] [4]**

9. **Replaces Current Experimental Course?**
   [ ] YES **[X]** NO
   Replaces Course Number/Suffix:**[ ]**
   Previously offered **[ ]** times.

10. Proposed Course Uses: *(Check all that apply)*

[X]Own Program: **[X]**Major **[ ]**Minor **[ ]**Masters **[ ]**Credential **[ ]**Other

[ ] Requirement or Elective in another Program
[ ] General Elective
[ ] General Education, Section **[ ]**
[ ] Meets GE Information Competence (IC) Requirement
[ ] Meets GE Writing Intensive (WI) Requirement
[ ] Community Service Learning (CS)
[ ] Cross-listed with: *(List courses)* **[ ]**

11. Justification for Request: *Course use in program, level, use in General Education, Credential, or other. Include information on overlap/duplication of courses within and outside of department or program. (Attach)*

12. Estimate of Impact on Resources within the Department, for other Departments and the University. *(Attach)*

(See Resource List)

13. Course Outline and Syllabus *(Attach) Include methods of evaluation, suggested texts, and selected bibliography.* Describe the difference in expectations of graduates and undergraduates for all 400 level courses that are offered to both.

14. Indicate which of the PROGRAM'S measurable Student Learning Outcomes are addressed in this course. *(Attach)*

15. Assessment of COURSE objectives *(Attach)*

A. Identify each of the course objectives and describe how the student performance will be assessed

(For numbers 14 and 15, see Course Alignment Matrix and the Course Objectives Chart)

16. If this is a General Education course, indicate how the General Education Measurable Student Learning Outcomes (from the appropriate section) are addressed in this course. *(Attach)*

17. Methods of Assessment for Measurable Student Learning Outcomes *(Attach)*

A. Assessment tools
B. Describe the procedure dept/program will use to ensure the faculty teaching the course will be involved in the assessment process (refer to the university's policy on assessment.)

18. Record of Consultation: *(Normally all consultation should be with a department chair or program coordinator.) If more space is needed attach statement and supporting memoranda.*

Date:	Dept/College:	Department Chair/ Program Coordinator	Concur (Y/N)
[3/5/2015]	[CECM/ECS]	[N. Dermendjian]	[Y]
[3/5/2015]	[CS/ECS]	[R. Covington]	[Y]

[3/5/2015]	[ECE/ECS]	[A. Amini]	[Y]
[3/5/2015]	[ME/ECS]	[H. Johari]	[Y]
[3/5/2015]	[MSEM/ECS]	[K. Chang]	[Y]
[ ]	[ ]	[ ]	[ ]

Consultation with the Oviatt Library is needed to ensure the availability of appropriate resources to support proposed course curriculum.

Collection Development Coordinator **Date**

Please send an email to: collection.development@csun.edu **[3/5/2015]**

19. Approvals:

Department Chair/Program Coordinator:	Hamid Johari	Date:	[3/5/2015]
College (Dean or Associate Dean):	Robert Ryan	Date:	[3/25/2015]
Educational Policies Committee:		Date:	[ ]
Graduate Studies Committee:		Date:	[ ]
Provost:		Date:	[ ]

11. Justification for Request:

Currently the undergraduate program in Mechanical Engineering offers only one heat transfer course (ME 375) which is insufficient to cover the breadth of heat transfer topics required in an undergraduate program. The proposed course will cover the topics that are needed for heat transfer engineers entering industry. Moreover, this course is expected to bridge the gap between the basic heat transfer course ME 375 and advanced graduate level courses such as ME 575 and ME 675A/B.

12. Estimated Impact on Resources within the Department, for other Departments and the University:

Minimal impact is expected on departmental resources because the tenure track faculty member currently assigned to teaching one of the thermal-fluid senior electives will be assigned to teach this new course. Moreover, the addition of this new senior elective course will relieve some of the overcrowding in the other thermal-fluid courses which has been caused by the significant enrollment increase in the undergraduate Mechanical Engineering program.

13. Course Outline and Syllabus:

ME 475 Heat Transfer II

Prerequisites: ME 375; ME 390; ME 280, Math 280, or ECE 280

Textbook: Required: **Fundamentals of Heat and Mass Transfer -** Incorpera, Dewitt, Bergman, Lavine; Wiley, 6th edition, 2007

References:

Heat and Mass Transfer - Cengel and Ghajar; McGraw Hill, Fifth edition, 2011
Heat Transfer - Holman; McGraw Hill, 10th Edition, 2010

Course Content: The topics to be covered is listed below along with the time allotted to each topic.

A. Introduction (Time Allotted: 1 week)
1. Definitions
    a. Brief overview of heat transfer
    b. Introduce the concepts of conduction, convection and radiation heat transfer

B. Conduction Heat Transfer (Time Allotted: 2 weeks)
1. Overview of the two-dimensional steady state conduction
2. Method of separation of variables
3. The conduction shape factor

C. Convective Heat Transfer (Time Allotted: 1 week)
1. Boundary Layer Analogy

D. External Flow (Time Allotted: 2 weeks)
1. Flow across banks of tubes
2. Impinging Jets

E. Internal Flow (Time Allotted: 1 week)
1. Non-circular tubes
2. Microscale Internal Flow

F. Free Convection (Time Allotted: 1 week)
1. Parallel plate channels and enclosures

G. Heat Exchangers (Time Allotted: 2 weeks)
1. LMTD method
2. NTU method

H. Boiling and Condensation (Time Allotted: 2 weeks)

1. Boiling modes
2. Pool and flow boiling
3. Condensation

I. Radiation Heat Transfer (Time Allotted: 2 weeks)

1. Radiation intensity
2. Emission from real surfaces
3. Environmental radiation

J. Diffusion Mass Transfer (Time Allotted: 1 week)

1. Diffusion mass transfer, physical origins and rate equations

Course Objectives: On successful completion of the course, students will be able to:

- Formulate and analyze a heat transfer system to calculate the heat transfer rates.
- Employ advanced engineering design techniques for common types of heat transfer problems encountered in industrial applications.
- Find and utilize the appropriate sources (through journals, magazines, and company and university web sites) for further information on heat transfer systems and processes

Grading: There will be two midterm exams and one final exam in addition to the homework assignments and one project. The breakdown of the final grade is as follows:

Assignment	% of final grade
Homework	10%
Project	20%
Midterm 1	20%
Midterm 2	20%
Final	30%

Homework: Homework problems will be assigned once a week approximately and they are due in the class the following week. No late homework will be accepted.

Project: The project will address the use of multiple modes of heat transfer. The students will be asked to design a heat transfer system for a practical application such as electronics cooling or heat engine cooling.

Course Policies: Attendance is mandatory for all classes. Please bring your textbook to class. For help on homework problems, you should have tried the problem on your own first.

14. Indicate which of the Program's Measurable Student Learning Outcomes are addressed in this course:

Demonstration of Program Outcomes in course
a. an ability to apply knowledge of mathematics, science, and engineering
e. an ability to identify, formulate, and solve engineering problems

15. Assessment of COURSE objectives

The three course objectives listed in the course outline are assessed through the homework and examinations in addition to the project. The alignment of the course objectives and the student assessment tools is shown in the table below.

Course Objectives	Assessments of Student Performance
1. Formulate and analyze a heat transfer system to calculate the heat transfer rates.	Examinations and Homework
2. Employ advanced engineering design techniques for common types of heat transfer problems encountered in industrial applications	Examinations, Homework and project
3. Find and utilize the appropriate sources (through journals, magazines, and company and university web sites) for further information on heat transfer systems and processes	Project

16. Not Applicable

17. Methods of Assessment for Measurable Student Learning Outcomes:

A. Assessment Tools

Homework, Project, Examinations

COURSE ALIGNMENT MATRIX

Assess how well ____ME 475____ contributes to the program's student learning outcomes by rating each course objective for that course with an I, P or D.

I=introduced (basic level of proficiency is expected)
P=practiced (proficient/intermediate level of proficiency is expected)
D=demonstrated (highest level/most advanced level of proficiency is expected)

Course Objectives	Student Learning Outcome a	Student Learning Outcome e	
1. Formulate and analyze a heat transfer system to calculate the heat transfer rates.	D	D	
2. Employ advanced engineering design techniques for common types of heat transfer problems encountered in industrial applications	D	D	
3. Find and utilize the appropriate sources (through journals, magazines, and company and university web sites) for further information on heat transfer systems and processes	P	P	

B) Describe the procedure dept/program will use to ensure the faculty teaching the course will be involved in the assessment process

The ME Department has developed a Course Evaluation Form which is used by all full-time and part-time faculty members to evaluate program outcomes and course objectives. All mechanical engineering courses are evaluated according to a defined schedule. The form template is attached.

Mechanical Engineering - Course Evaluation Form

Course Number: **Instructor:** **Semester/year:**

The purpose of this is form is to document the achievement of course objectives and program outcomes in the courses that you instruct. Answers to the questions below should cite supporting evidence from your own observations, student performance on assignments and examinations, and other feedback.

☐ **First time course taught by this instructor** ☐ **Course taught previously**

Course prerequisite(s) _____ _____ _____

- **Were the students adequately prepared by prerequisite courses?** **Yes** ☐ **No** ☐

- Were changes implemented since the last time this course was taught? **Yes** ☐ **No** ☐

If Yes, what changes were made since the last time this course was taught? Did these changes improve the course?

Changes made since last time	*Effects of change*

- Are changes called for the next time this course is taught? **Yes** ☐ **No** ☐

If Yes, what changes should be made the next time this course is taught?

Changes recommended for next time	*Purpose of changes*

Most useful comments from students:

Achievement of Course Objectives/Demonstration of Program Outcomes

Did the students demonstrate achievement of the course objectives and program outcomes specific to this course? In the table below, rate achievement of objectives/outcomes using evidence from direct assessment of student work, student surveys, etc.

If sampling, please indicate the approximate percent of the class sampled:
Use assessment rubrics for determining program outcome assessment

Course Objectives/Program Outcomes *List Course Objectives first, followed by Program Outcomes*	*Means of Direct Assessment by Instructor—what evidence was used for your assessment?*	*Instructor's Direct Outcome Assessment* *4=Excellent to 0=Poor*	*Improved (yes/no/??) compared to last year*