TO: The Faculty of the College of Engineering

FROM: The Faculty of the School of Industrial Engineering

RE: Creation of new course – IE 47200: Imagine, Model, Make

The faculty of the School of Industrial Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

Course #: IE 47200 – Imagine, Model, Make
Term Offered: Sem. 1; Lecture 3, Cr. 3

Prerequisites: None
Description: This course develops a holistic view of an initial competency in engineering design by conceiving, designing, manufacturing, and optimizing a system component such as a complex structural part. Activities include hand sketching, CAD modeling, and operation of CNC machining equipment for rapid prototyping. Tolerance requirements will be verified and optimized prior to the fabrication of the part in the laboratory using rapid prototyping techniques. The focus is on the design process itself as well as the complementary roles of human creativity and computational methods and tools.

Learning Outcomes: Students will…

1. be able to create any object using 3D CAD design software (modeling, texturing, and animation).
2. evaluate and optimize 3D designs for different manufacturing processes and materials.
3. apply the principles of engineering tolerance to 3D CAD design.
4. use rapid prototyping techniques (laser cutting, laser engraving, injection molding, and 3D printing) to manufacture 3D CAD designs.

Reason:
Imagine, Model, and Make is the only course provided by the School of Industrial Engineering that gives the students the opportunity to master CAD modeling and the design of parts from hand-drawn schematics. The skills developed by the students after this course allow them to transform their conceptual ideas into manufacturable CAD files, as well as present them to the general public through hyper-realistic illustrations and animations. The course teach CAD modeling and animation to students through a series of realistic manufacturing examples (engines, architectural designs, animated mechanical mechanisms...) that require the students to apply engineering tolerance and to develop a deeper understanding of the manufacturing capabilities of a variety of rapid prototyping techniques. In addition, the course emphasizes the integration of digital tools with the larger manufacturing enterprise.

Abhi Deshmukh 2/3/17

Abhijit Deshmukh
Professor and Head
School of Industrial Engineering

Office of the Registrar
FORM 40 REV. 5/11

PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

Print Form

DEPARTMENT Industrial Engineering

EFFECTIVE SESSION Fall 2017

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [X] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	IE	Subject Abbreviation	
Course Number	47200	Course Number	
Long Title	Imagine, Model, Make		
Short Title	Imagine, Model, Make		

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[X] Fall [ ] Spring [ ] Summer

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs
(Check One) To [ ] Or [ ]
Maximum Cr. Hrs.
3. Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees: [ ] Coop [ ] Lab [ ] Rate Request
Include comment to explain fee
6. Registration Approval Type
Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

ScheduleType	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	3	15	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):
This course develops a holistic view of an initial competency in engineering design by conceiving, designing, manufacturing, and optimizing a system component such as a complex structural part. Activities include hand sketching, CAD modeling, and operation of CNC machining equipment for rapid prototyping. Tolerance requirements will be verified and optimized prior to the fabrication of the part in the laboratory using rapid prototyping techniques. The focus is on the design process itself as well as the complementary roles of human creativity and computational methods and tools.

*COURSE LEARNING OUTCOMES:
Learning Outcomes: Students will: 1. be able to create any object using 3D CAD design software (modeling, texturing, and animation). 2. evaluate and optimize 3D designs for different manufacturing processes and materials. 3. apply the principles of engineering tolerance to 3D CAD design. 4. use rapid prototyping techniques (laser cutting, laser engraving, injection molding, and 3D printing) to manufacture 3D CAD designs.

Calumet Department Head	Date	Calumet School Dean	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date
North Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date
Abbi Dorbeck	2/3/17		
West Lafayette Department Head	Date	West Lafayette College/School Dean	Date

West Lafayette Registrar Date

OFFICE OF THE REGISTRAR

IE – Imagine, Model, and Make (Fall 2016)

Instructor: Professor Ramses V. Martinez - Office Hours: Wed 10: 30am -12:00 pm or by appointment.
Office: GRISSOM HALL Rm. 284. Phone: 49-60399 (Office) E-mail: rmartinez@purdue.edu

TA: Debkalpa Goswami [dgoswami@purdue.edu]

Time: Tuesday, Thursday. From 1:30pm to 2:45pm
Place: Grissom Hall of Industrial Engineering (GRIS-134)
Course Credits: 3.0 Course Number: IE-490 (CRN 12004)
Course open to: Any major: Undergraduate, Graduate, or Professional.
Prerequisites: This course does not require to have any previous experience on 3D modeling software, design, or manufacturing techniques.

Goal: This course provides students with an opportunity to design, optimize, manufacture, and validate a physical system component by learning 3D CAD design and the capabilities of basic manufacturing equipment and processes.

Course Description: This course develops a holistic view of an initial competency in engineering design by conceiving, designing, manufacturing, and optimizing a system component such as a complex structural part. Activities include hand sketching, CAD modeling, and operation of CNC machining equipment for rapid prototyping. Tolerance requirements will be verified and optimized prior to the fabrication of the part in the laboratory using rapid prototyping techniques. The focus is on the design process itself as well as the complementary roles of human creativity and computational methods and tools. The pedagogy is based on active learning and a balance of lectures and hands-on activities.

Objectives:

- To learn the use of 3D CAD design software (modeling, texturing, and animation).
- To become familiar with the different manufacturing processes and materials.
- To understand the fundamentals of engineering design and engineering tolerance.
- To understand the capabilities of modern rapid prototyping techniques (laser cutting, laser engraving, injection molding, and 3D printing).

Required Textbook: This course will only require to follow the lecture notes provided by the professor.

References:

1. *"DeGarmo's Materials & Processes in Manufacturing" by J. T. Black and Ronald A. Kohser 11th edition.*
2. *"Manufacturing Processes for Engineering Materials SI" by Serope Kalpakjian, Stephen R. Schmid, and Chih-Wah Kok. ISBN-10: 0132272717.*
3. *"Autodesk 3ds Max 2014 Bible" Wiley. ISBN-10: 1118755073.*

Course Outline:

1. **Introduction to Manufacturing Engineering**
2. **Properties of Materials.**
3. **Fundamentals of 3D CAD design.**
   Project 1: Simple 3D Models: Modeling a house.
   Project 2: (Polygon editing 1) Modeling complex shapes.
   Project 3: (Polygon editing 2) Modeling a car from a hand sketch.
4. **Animation and Application of Materials and Textures to 3D Models.**
   Project 4: (Rendering 1) Applying materials to your car and making it to move.
5. **Engineering Tolerances and Optimization**
   Project 5: (Tolerances 1, Rendering 2) Modeling the components of your own smart watch.
   Project 6: (Polygon editing 3) Modeling your own face.
6. **Fundamentals of Machining and Laser Cutting**
   Project 7: Design, cut, and engrave your own key ring using a laser cutter. [LABS]
   MIDTERM EXAM [lessons 1-6] (November 11, 2015)
7. **Special Effects, Advanced Lighting, Realistic Human Characters and Videogame Animations. [LABS]**
   Project 8: (Engineering Design and Tolerances 2) Design your own industrial product and make a realistic animation demonstrating its capabilities.
8. **3D Printing and other Rapid Prototyping Techniques [LABS]**
   Final Project: Fabricate your own vehicle + articulated action figure using a 3D printer.
   FINAL EXAM (TBA)

Rules:

Attendance to class

- You are required to come to the class. Attendance is required at all scheduled class meetings.

Homeworks and Projects

- Homework will be assigned during the class. Unless otherwise indicated, they are to be submitted one week later.
- All homework will have an explicit deadline. You can submit a printed copy of your homework any time before the deadline. LATE HOMEWORK WILL NOT BE ACCEPTED (ABSOLUTELY NO EXCEPTIONS).
- The solutions of the homework assignments will be provided during the class, not on Blackboard. Make sure you attend to class or the office hours if you have any question regarding your homework.
- At the end of the course, the homework assignment with the lowest score will be removed and you will be given a final grade (30% of your final score) according to the average of the remaining HWs.

YouTube Channel

- During this course the students will make videos and tutorials using CAD software. The best videos will be uploaded to the YouTube channel of the course:
  https://www.youtube.com/channel/UC5AZJxIO6ku3jledDhUMPYg/playlists

Collaboration and Academic Honesty:

Collaboration is highly encouraged in this course. However, academic misconduct on tests or exams will not be tolerated and will result in a mark of F for course, for all students involved. Within this context academic misconduct includes actions such as looking at another student's test/exam, bringing notes into an exam, asking/paying another student to write a test or exam or complete a project for you, turning in altered tests for a regrade, etc. any act of academic dishonesty will be reported to the Dean of Students and may ultimately lead to the end of your career at Purdue.

Grading:

- Homeworks: 70%
- Midterm: 15%
- Final Project: 15%
- (Optional) Preparation of Video Tutorials for our YouTube Channel: 5%

Regrading: You may ask for a test or exam regrade within 10 days of it being handed out to the class (whether or not you received your test that day). You will need to submit a separate sheet of paper explaining the question(s) of concern and where you feel there is a discrepancy in marks, but note that your entire exam will be regraded.

Classroom Conduct: You are expected to arrive to class on-time, turn off all electronic devices (laptops, cell phones, etc.), refrain from distracting other students (e.g., sleeping, side conversations, etc.). Persistent poor classroom conduct will result in grade deductions.

Disclaimer: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to change, as is the course schedule. Any such changes will be posted on Blackboard.