### MECH4902 – Solar Energy Conversion Technology

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<th>Course Code: MECH4000N</th>
<th>Course Title: Solar Energy Conversion Technology</th>
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<tr>
<td>Required Course Or Elective Course: Elective</td>
<td>Terms Offered (Credits): Fall or Spring (3 credits)</td>
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<td>Faculty In Charge: Zhou Yanguang</td>
<td>Pre/Co-Requisites: MECH3310 or MECH3300</td>
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| Course Structure: Lecture: 2 sessions/week, 80 minutes/session |
| Textbook/Required Material: Solar Energy Engineering: Processes and Systems |

#### Bulletin Course Description:
principles and technologies for converting solar into heat, solar into electricity and solar to chemistry energy; solar collecting and concentrating technology; photovoltaic cells; thermal energy storage.

#### Course Topics:
1. Introduction to solar, electrical and thermal energy conversion technology
2. Environmental characteristics
3. Solar concentrating
4. Solar Heating and Cooling
5. Solar Chemistry
6. Solar Desalination
7. Photovoltaic
8. Solar Economic Analysis
9. Advanced solar energy conversion technology: examples
10. Presentations by students

#### Course Objectives:
1. To provide our students with a fundamental understanding of solar energy conversion. (P-O1, P-O3)
2. To provide our students with the ability to apply knowledge of mathematics and science to solve engineering problems in solar energy conversion, e.g., solar-heat, solar-chemistry and solar-electricity conversion. (P-O3)
3. To provide our students with the ability to identify a suitable model and formulate scientific analysis for practical problems in solar energy conversion process. (P-O3, P-O5)
4. To inspire students to understand the nature (solar swimming pool heating) and man-made (photovoltaic) system involving solar energy conversion using the knowledge obtained in classes. (P-O1, P-O3, P-O4, P-O5)
5. To provide our students the knowledge to calculate the economic performance of the solar energy conversion process. (P-O1, P-O3, P-O4)

#### Course Outcomes:
1. Explain the basic concepts of environmental characteristics, e.g., declination latitude and azimuth angle et al. (1) (POC1)
2. Examine blackbody and gray surface radiation, and evaluate radiation exchange between surfaces using Stefan-Boltzmann
BEng in Mechanical Engineering and Sustainable Energy Engineering (3&4-year program)

Program Objectives:

P-O1. Be able to communicate and perform as an effective engineering professional in both individual and team-based project environments,

P-O2. Have an international outlook with clear perspectives on the Pearl river Delta and Greater China,

P-O3. Be able to research, design, develop, test, evaluate and implement engineering solutions to problems that are of complexity encountered in professional practice and leadership,

P-O4. Clearly Consider the ethical implications and societal impacts of engineering solutions,

P-O5. Continuously improve through lifelong learning.

Program Outcomes:

POC1. ability to identify and formulate problems in multidisciplinary environment with an understanding of engineering issues and constraints;

POC2. ability to design and conduct experiments as well as analyze and interpret data;

POC3. ability to apply knowledge of mathematics, science, and engineering for problem solving in mechanical engineering and related sectors or for further education in a research career;

POC4. ability to develop specification and to design system, component, or process to meet needs;

POC5. ability to understand the manufacturability, maintainability, and recyclability of engineering system and components;

POC6. ability to use modern engineering tools, techniques, and skills in engineering practice;

POC7. ability to communicate effectively;

POC8. ability to function in multi-disciplinary teams and provide leadership;

POC9. broadly educated with an understanding of the impact of engineering solutions on issues such as economics, business, politics, environment, health and safety, sustainability, and societal context;

POC10. clear understanding of professional and ethical responsibilities;

POC11. recognition of the need for life-long learning and continuing education;

POC12. international outlook with knowledge of contemporary issues.

Assessment Tools:

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<th>(correlated course outcomes)</th>
<th>Regular homework assignments – 30% (B, C, D, E, F)</th>
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<tr>
<td></td>
<td>Site visit – 10% (A,B,C,D,E,F)</td>
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<td>Mid-term – 20% (A, B, C, D)</td>
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<td>Individual report – 10% (A,B,C,D,E,F)</td>
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<td>Individual report presentation – 20% (A,B,C,D,E,F)</td>
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<td>Course participation – 10%</td>
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