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| Module code | SP-4310 | | |
| Module Title | The Physics of Solar Cells | | |
| Degree/Diploma | Bachelor of Science (Applied Physics) | | |
| Type of Module | Major Option | | |
| Modular Credits | 4 | Total student Workload | 10 hours/week |
| | | Contact hours | 4 hours/week |
| Prerequisite | None | | |
| Anti-requisite | None | | |
| Aims | | | |
| This module aims to give students an understanding of the device physics, materials, and characterisation techniques relevant to solar cells. | | | |
| Learning Outcomes | | | |
| <i>On successful completion of this module, a student will be expected to be able to:</i> | | | |
| Lower order : | 10% | - describe common solar cell characterisation techniques and standard test conditions | |
| Middle order : | 40% | - qualitatively explain the operation of conventional p-n junction solar cells and emerging excitonic solar cells - understand the predominant loss mechanisms in various types of solar cell - explain why there is a theoretical limit to the efficiency of solar cells | |
| Higher order: | 50% | - apply simple mathematical models to predict and analyse the current voltage characteristics of various types of solar cells - understand solar cell models based on continuity equations governing the generation, transport, and recombination of charge carriers - work independently and also collaboratively in a team - interpret the results of analyses, and make appropriate reports and presentations for effective communication | |
| Module Contents | | | |
| <ul style="list-style-type: none"> - Terrestrial solar irradiance spectrum - photovoltaic parameters - spectral quantum efficiency - Shockley–Queisser detailed balance approach - continuum models - recombination mechanisms - operating principles of mono- and poly-crystalline Si, CIGS, CdTe, dye-sensitized, organic, perovskite and multi-junction solar cells - third-generation concepts including intermediate band cells and multiple exciton generation | | | |
| Assessment | Formative assessment | In-class questions, homework problems and feedback | |
| | Summative assessment | Examination: 30% Coursework: 70% <ul style="list-style-type: none"> - 2 class tests (20%) - 3 written assignments (30%) - 1 literature survey (10%) - 1 oral presentation (10%) | |