

## Subject Description Form

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| <b>Subject Code</b>                                   | EIE572   |
| <b>Subject Title</b>                                  | Information Photonics  |
| <b>Credit Value</b>                                   | 3  |
| <b>Level</b>  | 5  |
| <b>Pre-requisite/<br/>Co-requisite/<br/>Exclusion</b> | N/A  |
| <b>Objectives</b>                                     | <ol style="list-style-type: none"> <li>1. To learn the fundamental principle of information photonics.</li> <li>2. To understand processes to control and manipulate the photonic information.</li> <li>3. To know the working principle and applications of the modern information photonics devices and systems.</li> </ol>  |
| <b>Intended Learning Outcomes</b>                     | <p>Upon completion of the subject, students will be able to:</p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>a. Learn the fundamental principles of information photonics.</li> <li>b. Understand the knowledge about practical information photonic components and systems, and an overview of applications of information photonics.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>c. Communicate effectively.</li> <li>d. Think critically and creatively.</li> <li>e. Assimilate new technological development in related field.</li> </ol>                                 |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b>      | <ol style="list-style-type: none"> <li>1. Information Communication.</li> <li>2. Introduction to Photonics.</li> <li>3. Vision, Visual Perception, and Computer vision.</li> <li>4. Photonic Sources and Detectors for Information Processing.</li> <li>5. Photonic Devices for Modulation, Storage and Display.</li> <li>6. Photonics in Transform Domain Information Processing.</li> <li>7. Low-Level Photonic Information Processing.</li> <li>8. Photonics in Networking and Communication.</li> <li>9. Photonic Computing.</li> <li>10. Photonic Pattern Recognition and Intelligent Processing.</li> <li>11. Nanophotonic Information System.</li> <li>12. Quantum Information Processing.</li> </ol> |
| <b>Teaching/Learning Methodology</b>                  | <p>This subject aims to provide students with fundamental and practical understanding of information photonics. The concepts and principles of information photonics will be described and explained in this subject. The information photonic components and systems will be introduced and the engineering working principle of them will be explained. Students will be required to study some application cases about the advanced information photonics, and share their findings with other classmates through presentations and write a report summarizing their findings.</p>  |

|  | <table border="1"> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="5">Intended Subject Learning Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> <tr> <td>Lecture</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Tutorial</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Presentation / Case study</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </table>  |  |   |   |   |          | Teaching/Learning Methodology     | Intended Subject Learning Outcomes |  |  |  |  | a | b | c | d | e | Lecture | ✓                        | ✓   |   | ✓ | ✓ | Tutorial | ✓ | ✓               | ✓   | ✓ | ✓ | Presentation / Case study | ✓ | ✓ | ✓                              | ✓   | ✓ |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
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| Teaching/Learning Methodology  | Intended Subject Learning Outcomes  |  |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | a   | b  | c | d | e |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| Lecture  | ✓   | ✓  |   | ✓ | ✓ |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| Tutorial   | ✓   | ✓  | ✓ | ✓ | ✓ |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| Presentation / Case study  | ✓   | ✓  | ✓ | ✓ | ✓ |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>1. Homeworks/Assignments</td> <td>30%</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Midterm test</td> <td>20%</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Case study and presentation</td> <td>20%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>4. Final examination</td> <td>30%</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td colspan="5"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Homework, tests and case study let students review the taught materials, do further reading for deeper learning and apply the learnt materials to solve the problems in Information Photonics.</p> <p>Case study requires the student to do further reading, search for information, keep abreast of current developments in Information Photonics, give a presentation and write a report.</p> <p>Final examination requires students to answer questions about the fundamentals and technologies of information photonics.</p> |  |   |   |   |          | Specific assessment methods/tasks | % weighting                        | Intended subject learning outcomes to be assessed (Please tick as appropriate) |  |  |  |   | a | b | c | d | e       | 1. Homeworks/Assignments | 30% | ✓ | ✓ |   | ✓        | ✓ | 2. Midterm test | 20% | ✓ | ✓ |                           |   |   | 3. Case study and presentation | 20% | ✓ | ✓ | ✓ | ✓ | ✓ | 4. Final examination | 30% | ✓ | ✓ |  | ✓ | ✓ | Total | 100% |  |  |  |  |  |
| Specific assessment methods/tasks                                      | % weighting   | Intended subject learning outcomes to be assessed (Please tick as appropriate) |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  |   | a  | b | c | d | e        |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| 1. Homeworks/Assignments   | 30%   | ✓  | ✓ |   | ✓ | ✓        |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| 2. Midterm test  | 20%   | ✓  | ✓ |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| 3. Case study and presentation   | 20%   | ✓  | ✓ | ✓ | ✓ | ✓        |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| 4. Final examination   | 30%   | ✓  | ✓ |   | ✓ | ✓        |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| Total  | 100%  |  |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Student Study Effort Expected</b>                                   | Class contact:  |  |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | ▪ Lecture/Tutorial  |  |   |   |   | 33Hrs.   |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | ▪ Case study – presentations and discussions  |  |   |   |   | 6 Hrs.   |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | Other student study effort:   |  |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | ▪ Homework/assignment and further case study, presentation preparation.   |  |   |   |   | 66 Hrs.  |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
|  | Total student study effort  |  |   |   |   | 105 Hrs. |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Reading List and References</b>                                     | <ol style="list-style-type: none"> <li>1. Bahaa E.A. Saleh, Fundamentals of Photonics, 3<sup>rd</sup> (2019).</li> <li>2. Asit Kumar Datta and Soumika Munshi, Information Photonics: Fundamentals, Technologies, and Applications (2017).</li> <li>3. Georg A Reider, Photonics An Introduction (2016).</li> <li>4. Craig Hoffman, Encyclopedia of Optical and Photonic Engineering (2014).</li> <li>5. Clifford R. Pollock and Michal Lipson, Integrated Photonics (2003).</li> </ol>   |  |   |   |   |          |                                   |                                    |  |  |  |  |   |   |   |   |   |         |                          |     |   |   |   |          |   |                 |     |   |   |                           |   |   |                                |     |   |   |   |   |   |                      |     |   |   |  |   |   |       |      |  |  |  |  |  |