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|  | <p>Ministry of Higher Education and<br/>Scientific Research - Iraq</p> <p>University of Warith Al-Anbiyaa<br/>Engineering College<br/>Biomedical Engineering Department</p> |  |
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## MODULE DESCRIPTION FORM

| Module Information                        |                        |  |                                      |                                                                                                                                                                                                                                          |  |
|-------------------------------------------|------------------------|--|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Module Title</b>                       | Laser and Fiber Optics |  |                                      | <b>Module Delivery</b>                                                                                                                                                                                                                   |  |
| <b>Module Type</b>                        | Core                   |  |                                      | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |  |
| <b>Module Code</b>                        | BME-325                |  |                                      |                                                                                                                                                                                                                                          |  |
| <b>ECTS Credits</b>                       | 4                      |  |                                      |                                                                                                                                                                                                                                          |  |
| <b>SWL (hr/sem)</b>                       | 150                    |  |                                      |                                                                                                                                                                                                                                          |  |
| <b>Module Level</b>                       | 3                      |  | <b>Semester of Delivery</b>          |                                                                                                                                                                                                                                          |  |
| <b>Administering Department</b>           | BME                    |  | <b>College</b>                       | ENG                                                                                                                                                                                                                                      |  |
| <b>Module Leader</b>                      | Saad Mahmood Sarhan    |  | <b>e-mail</b>                        | saad.mah@uowa.edu.iq                                                                                                                                                                                                                     |  |
| <b>Module Leader's Acad. Title</b>        | Assistant Doctor       |  | <b>Module Leader's Qualification</b> | Ph.D.                                                                                                                                                                                                                                    |  |
| <b>Module Tutor</b>                       |                        |  | <b>e-mail</b>                        |                                                                                                                                                                                                                                          |  |
| <b>Peer Reviewer Name</b>                 |                        |  | <b>e-mail</b>                        |                                                                                                                                                                                                                                          |  |
| <b>Scientific Committee Approval Date</b> |                        |  | <b>Version Number</b>                | 1.0                                                                                                                                                                                                                                      |  |

| Relation with other Modules |                       |  |                 |   |
|-----------------------------|-----------------------|--|-----------------|---|
| <b>Prerequisite module</b>  | None                  |  | <b>Semester</b> |   |
| <b>Co-requisites module</b> | Electromagnetic field |  | <b>Semester</b> | 5 |

| Module Aims, Learning Outcomes and Indicative Contents |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <b>Module Aims</b>                                     | <p>Building the student scientifically and qualifying him to understand:</p> <ol style="list-style-type: none"> <li>1. Study the electromagnetic nature of light which includes the idealization of waves as light rays and the polarization of light</li> <li>2. Study Fiber optics communication system, types of fiber also the medical applications with emphasis on those used in biomedical engineering.</li> <li>3. OPTIWAVE Simulation System used in optical Lab</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b>                        | <p>A- Cognitive goals .</p> <ol style="list-style-type: none"> <li>1. A1- The course provides the students the essential knowledge related to Study Fiber optics communication system</li> <li>2. A2- The student learns types of fiber also the medical applications with emphasis on those used in biomedical engineering</li> <li>3. A3- Study the electromagnetic nature of light which includes the idealization of waves as light rays and the polarization of light</li> <li>4. A4- Performs laboratory experiments A5- Acquire skill in simulation and programming programs to illustrate different waveforms</li> </ol> <p>B. The skills goals special to the course.</p> <ol style="list-style-type: none"> <li>5. B1 - Training the student to explore problems and find solutions</li> <li>6. B2 - Training the student in scientific research in a specialized manner</li> <li>7. B3 - Training the student on the practical application of the theoretical lecture and comparison between practical and theoretical results B 4- Training the student to form a scientific seminar and to participate in discussing and analyzing the results</li> </ol> |

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>Indicative Contents</b> | <p>Indicative content includes the following.</p> <p><b>Part A : optical communication Systems</b></p> <ul style="list-style-type: none"> <li>• Introduction: [4hrs]</li> <li>• Historical development; The general system; Advantages of optical fiber communication. [6hrs]</li> <li>• Optical Fiber Waveguides: [8 hrs] .</li> <li>• Fiber types; [8hrs]</li> </ul> <p>Ray theory transmission;<br/>Total internal reflection; Acceptance angle; Numerical aperture;<br/>Electromagnetic mode theory for optical propagation;<br/>Electromagnetic waves; Modes in a planer guide. [12 hrs]</p> <ul style="list-style-type: none"> <li>• Transmission Characteristics of Optical Fibers: [4 hrs]</li> </ul> <p>3</p> <ul style="list-style-type: none"> <li>• Attenuation; Material absorption losses; Intrinsic and extrinsic absorption; Linear scattering; Rayleigh and Mie scattering;</li> <li>• Nonlinear scattering losses; Stimulated Brillouin and Raman scattering; Fiber bend losses; Dispersion; Intra-modal dispersion; Inter-modal dispersion; modal noise. [4 hrs]</li> </ul> <p><b>Part B: Medical application</b></p> <ul style="list-style-type: none"> <li>• Endoscopes</li> <li>• Laser applications in dentistry</li> <li>• Optical fibers in Textiles</li> <li>• Laser Brain Surgery [12hrs ]</li> </ul> <p><b>Part C- Revision problem classes</b> [5 hrs]</p> |
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| <b>Learning and Teaching Strategies</b> |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                       | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b>   |     |                               |   |
|---------------------------------|-----|-------------------------------|---|
| <b>Structured SWL (h/sem)</b>   | 108 | <b>Structured SWL (h/w)</b>   | 7 |
| <b>Unstructured SWL (h/sem)</b> | 42  | <b>Unstructured SWL (h/w)</b> | 3 |
| <b>Total SWL (h/sem)</b>        | 100 |                               |   |

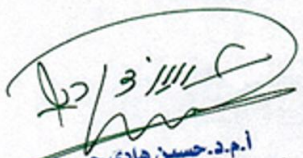
| Module Evaluation    |                 |             |                  |            |                           |
|----------------------|-----------------|-------------|------------------|------------|---------------------------|
|                      |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1, 2                  |
|                      | Assignments     | 2           | 10% (10)         | 2, 12      | LO #1, 2                  |
|                      | Projects / Lab. | 1           | 10% (10)         | Continuous | LO #1, 2                  |
|                      | Report          | 1           | 10% (10)         | 13         | LO #1, 2                  |
| Summative assessment | Midterm Exam    | 3 hrs.      | 10% (10)         | 7          | LO #1, 2                  |
|                      | Final Exam      | 3 hrs.      | 50% (50)         | 16         | LO #1, 2                  |
| Total assessment     |                 |             | 100% (100 Marks) |            |                           |

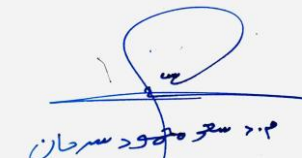
| Delivery Plan (Weekly Syllabus) |                                                |
|---------------------------------|------------------------------------------------|
|                                 | Material Covered                               |
| Week 1                          | Introduction to optical communication system   |
| Week 2                          | Benefits of Fiber Optics                       |
| Week 3                          | Nature of light                                |
| Week 4                          | Properties of light                            |
| Week 5                          | Fiber modes                                    |
| Week 6                          | Types of optical fibers                        |
| Week 7                          | Light sources                                  |
| Week 8                          | Light Emitting Diode                           |
| Week 9                          | Semiconductor laser.                           |
| Week 10                         | Transmission Characteristics of Optical Fibers |
| Week 11                         | Attenuation                                    |
| Week 12                         | Dispersion                                     |
| Week 13                         | MEDICAL APPLICATIONS OF OPTICAL FIBERS         |
| Week 14                         | Endoscopes                                     |
| Week 15                         | Laser applications in dentistry                |
| Week 16                         | Preparatory week before the final Exam         |

| Learning and Teaching Resources |                                                                                                                                                                         |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                 | Text                                                                                                                                                                    | Available in the Library? |
| <b>Required Texts</b>           | GOVIND E P. AGRAWAL, "Fiber optics communication systems."                                                                                                              | Yes                       |
| <b>Recommended Texts</b>        | JOHN M. SENIOR, "Optical Fiber Communications                                                                                                                           | No                        |
| <b>Websites</b>                 | <a href="https://www.coursera.org/browse/physical-science-and-engineering/">https://www.coursera.org/browse/physical-science-and-engineering/</a> optical Communication |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | (0-44)    | Considerable amount of work required  |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |           |                                       |

  
 Head of the Department  
 Dr. Osama Abdulbari

  
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 عميد كلية الهندسة

  
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