<table>
<tr><td>1.</td><td colspan="5">Name of Course</td><td>Optoelectronics</td></tr>
<tr><td>2.</td><td colspan="5">Course Code</td><td>JOPE4083</td></tr>
<tr><td></td><td colspan="6">JOPE = the first alphabet identify the faculty within which the subject is offered. JOPE = the remaining three alphabet identify the course that offers the subject, 4083 = the first digit identify level of study; in this case undergraduate level, 4083= the second and third digits identify subject identity and 4083= the fourth digit identify credit value or credit hours.</td></tr>
<tr><td>3.</td><td colspan="5">Name(s) of academic staff</td><td>To be Assigned</td></tr>
<tr><td>4.</td><td colspan="5">Rationale for the inclusion of the course/module in the programme</td><td>Knowledge of optoelectronics is essential in civil engineering. Moreover, acquiring knowledge in Optoelectronics enable engineer to design communication links.</td></tr>
<tr><td>5.</td><td colspan="5">Semester and Year offered</td><td>Year 4, Semester 2</td></tr>
<tr><td rowspan="3">6.</td><td>Total Student Learning Time (SLT)</td><td colspan="4">Face to Face</td><td>Total Guided and Independent Learning</td></tr>
<tr><td rowspan="2">L = Lecture T = Tutorial
P = Practical
IS= Independent Study</td><td>L</td><td>T</td><td>P</td><td>IS</td><td rowspan="2">Total Guided and Independent Learning = 120</td></tr>
<tr><td>42</td><td>7</td><td>6</td><td>65</td></tr>
<tr><td>7.</td><td colspan="5">Credit Value</td><td>3.0</td></tr>
<tr><td></td><td colspan="6">Lecture: 3 hours per week x 14 weeks
Tutorial: 1 hour per week x 7 weeks
Practical: 2 hours x 3 weeks</td></tr>
<tr><td>8.</td><td colspan="5">Prerequisite (if any)</td><td>JELM1013: Electromagnetic Theory</td></tr>
<tr><td>9.</td><td colspan="6">Course Objectives
1. To introduce the communication links;
2. To equip the students with the knowledge of the fundamentals of optoelectronics, fibre optics, electro-optical components, and design of optical communication links.

Course Learning Outcomes (CLO)
At the end of the semester students should be able to:

CLO1: Analyze and design PIN photodetector circuits;
CLO2: Analyze and design laser optical cavities to meet output beam specifications;
CLO3: Analyze and design optical electronic systems;</td></tr>
<tr><td>10.</td><td colspan="6">Transferable Skills:
This course is expected the development of the following transferable skills:
▪ An ability to manage time and task
▪ An ability to learn both independently and co—operatively;
▪ An ability to take responsibility and carry out laboratory test;
▪ An ability to take initiative and lead other;
▪ An ability to use software where relevant to the subject.</td></tr>
<tr><td>11.</td><td colspan="6">Teaching-learning and assessment strategy

A variety of learning strategies are used throughout the course, including the following
• Classroom Lesson; Lecturer and power point presentation
• Tutorial session
• Student- lecturer Discussion</td></tr>
</table>

	• Collaborative and co-operative learn; • Independent study. **Assessment:** **Course works** **40%** Assignment 5% Tutorial 5% Quizzes 5% Laboratory works 10% Test 15% **Final Examination** **60%** **Total** **100%**
12.	**Synopsis:** This course is very important course in the field of electronics engineering. The objective of course is to introduce students to the fundamentals of optoelectronics, fibre optics, electro-optical components, and design of optical communication links.
13.	**Mode of Delivery:** Lectures; Tutorials; Laboratory works

14.	**Assessment Methods and Types:** **Performance Criteria :**						
	CLO-PLO	**Assessment Tool**	**1**	**2**	**3**	**4**	**5**
	Marks		**0-39**	**40-49**	**50-59**	**60-74**	**75-100**
	Grade		**(F)**	**(D,D+)**	**(C-,C,C+)**	**(B-,B,B+)**	**(A-,A,A+)**
	CLO1: To analyze and design PIN photodetector circuits;	**Assignment** **Tutorials** **Quizzes** **Lab works** **Test** **Examination**	**Fail To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Poor To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Satisfactory To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Good To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Excellent To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test
	CLO2: To analyze and design laser optical cavities to meet output beam specifications;	**Assignment** **Tutorials** **Quizzes** **Lab works** **Test** **Examination**	**Fail To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Poor To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Satisfactory To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Good To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Excellent To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test
	CLO3: To analyze and design optical electronic systems;	**Assignment** **Tutorials** **Quizzes** **Lab works** **Test** **Examination**	**Fail To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Poor To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Satisfactory To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Good To**: - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test	**Excellent To:** - manage time and task - learn both independently and cooperatively - take responsibility and carry out laboratory test

15. **Mapping of the Programme Objectives to the Programme Learning Outcomes**

Programme Learning Outcomes (PLO) / Programme Objectives (PO)	**PLO1:** Ability to acquire and apply knowledge of science and engineering fundamentals.	**PLO2:** Acquired in-depth technical competence in civil engineering discipline.	**PLO3:** Ability to undertake problem identification, formulation and solution;	**PLO4:** Ability to utilise systems approach to design and evaluate operational performance.	**PLO5:** Understanding of the principles of design for sustainable development;	**PLO6:** Understanding of professional and ethical responsibilities and commitment to them.	**PLO7:** Ability to communicate effectively, not only with engineers but also with the community at large.	**PLO8:** Ability to function effectively as an individual and in a group with the capacity to be a leader or manager;	**PLO9:** Understanding of the social, cultural, global and environmental responsibilities of a professional engineer	**PLO10:** Recognising the need to undertake lifelong learning, and possessing/acquiring the capacity to do so	**PLO11**: Ability become entrepreneur
PEO1: To produce graduates with excellent knowledge and competency in Electrical and Electronic Engineering;	✓	✓		✓		✓					
PEO2: To produce graduates with professional, generic attributes to meet the present and future global demands.											
PEO3: To produce graduates with Islamic humanistic values and reinvention skills to meet the requirement of a dynamic environment. These skills include Civil Intelligence, Moral Intelligence, Self-Reliance and Communication Skills.											

16. **Mapping of the course Learning Outcome to the Programme Outcome**

Programme Learning Outcomes (PLO) / Course Learning Outcome (CLO)	**PLO1:** Ability to acquire and apply knowledge of science and engineering fundamentals.	**PLO2:** Acquired in-depth technical competence in electrical and electronics engineering discipline.	**PLO3:** Ability to undertake problem identification, formulation and solution;	**PLO4:** Ability to utilise systems approach to design and evaluate operational performance.	**PLO5:** Understanding of the principles of design for sustainable development;	**PLO6:** Understanding of professional and ethical responsibilities and commitment to them.	**PLO7:** Ability to communicate effectively, not only with engineers but also with the community at large.	**PLO8:** Ability to function effectively as an individual and in a group with the capacity to be a leader or manager;	**PLO9:** Understanding of the social, cultural, global and environmental responsibilities of a professional engineer	**PLO10:** Recognising the need to undertake lifelong learning, and possessing/acquiring the capacity to do so	**PLO11**: Ability become entrepreneur
CLO1: To analyze and design PIN photodetector circuits;.	✓	✓		✓		✓					
CLO2: To analyze and design laser optical cavities to meet output beam specifications;	✓	✓		✓		✓					
CLO3: To analyze and design optical electronic systems; bitumen and bricks;	✓	✓		✓		✓					

17.	Content outline of the course/module and the SLT per topic						
	Details		SLT (Hour)				
			L	T	P	IS	Total
	Topic 1	**Wave Nature of Light.** • Light Waves in a Homogeneous Medium. • Refractive Index. • Group Velocity and Group Index. • Magnetic Field, • Irradiance and Poynting Vector. • Snell's Law and Total Internal Reflection (TIR). • Fresnel's Equations. • Multiple Interference and Optical Resonators. • Goos-Hänchen and Optical Tunneling. • Temporal and Spatial Coherence. • Diffraction Principles	6	1	-	10	17
	Topic 2	**Dielectric Waveguides and Optical Fibers.** • Symmetric Planar Dielectric Slab Waveguide. • Modal and Waveguide Dispersion in the Planar Waveguide. • Tep Index Fiber. • Numerical Aperture. • Dispersion in Single Mode Fibers. • Bit-Rate, • Dispersion, • Electrical and Optical Bandwidth. • The Graded Index Optical Fiber. • Light Absorption and Scattering. • Attenuation in Optical Fibers.	9	2	-	12	23
	Topic 3	**Semiconductor Science and Light Emitting Diodes.** • Semiconductor Concepts and Energy Bands. • Direct and Indirect Bandgap Semiconductors: • E-k Diagrams. • pn Junction Principles. • The pn Junction Band Diagram. • Light Emitting Diodes. • LED Materials. • Heterojunction High Intensity LEDs. • LED Characteristics. • LEDs for Optical Fiber Communications	6	1	-	10	17

	Topic 4	**Stimulated Emission Devices Lasers.** • Stimulated Emission and Photon Amplification. • Stimulated Emission Rate and Einstein Coefficients. • Optical Fiber Amplifiers. • Gas Laser: • The He-Ne Laser. • The Output Spectrum of a Gas Laser. • LASER Oscillation Conditions. • Principle of the Laser Diode. • Heterostructure Laser Diodes. • Elementary Laser Diode Characteristics. • Steady State Semiconductor Rate Equation. • Light Emitters for Optical Fiber Communications. • Single Frequency Solid State Lasers. Quantum Well Devices.	9	2	-	13	24
	Topic 5	**Photodetectors** • Principle of the pn Junction Photodiode. • Ramo's Theorem and External Photocurrent. • Absorption Coefficient and Photodiode Materials. • Quantum Efficiency and Responsivity. • The pin Photodiode. • Avalanche Photodiode. • Heterojunction Photodiodes. • Phototransistors. • Photoconductive Detectors and Photoconductive Gain. • Noise in Photodetectors	6	1	-	10	17
	Topic 6	**Photovoltaic Devices** • Solar Energy Spectrum. • Photovoltaic Device Principles. • Pn Junction Photovoltaic I-V Characteristics. • Series Resistance and Equivalent Circuit. • Temperature Effects. • Solar Cells Materials, • Devices and Efficiencies	6	-	-	10	16
	Practical	1. Modeling of LED device. 2. Modeling of photodetector device	-	-	6	-	6
	Total SLT (Hour)		**42**	**7**	**6**	**65**	**120**
18.	**Main references supporting the course** 1. Safa O. Kasap, Optoelectronics and Photonics: Principles and Practices, Prentice Hall 2009.						
	Additional references supporting the course						
19.	**Other additional information** All materials will be available to the students in the library.						