<table>
<tr><td>1.</td><td colspan="5">Name of Course</td><td>Highway and Traffic Engineering</td></tr>
<tr><td>2.</td><td colspan="5">Course Code</td><td>JHIT3293</td></tr>
<tr><td></td><td colspan="6">JHIT= the first alphabet identify the faculty within which the subject is offered., JHIT= the remaining three alphabet identify the course that offers the subject, 3293 = the first digit identify level of study; in this case undergraduate level, 3293 = the second and third digits identify subject identity and 3293= 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>This is Civil engineering subject. Students must understand and able to work in highway and Traffic Engineering field.</td></tr>
<tr><td>5.</td><td colspan="5">Semester and Year offered</td><td>2/3</td></tr>
<tr><td rowspan="3">6.</td><td colspan="2">Total Student Learning Time (SLT)</td><td colspan="3">Face to Face</td><td>Total Guided and Independent Learning</td></tr>
<tr><td colspan="2">L = Lecture T = Tutorial<br>P = Practical S=Studio Works<br>O= Others</td><td>L</td><td>T</td><td>P/S</td><td>O</td><td>Independent Study(IS)=84<br>Total=126</td></tr>
<tr><td colspan="2">42</td><td>-</td><td>14</td><td>-</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)<br>Practical (1 Hour per week x 14 weeks)</td></tr>
<tr><td>8.</td><td colspan="5">Prerequisite (if any)</td><td>None</td></tr>
<tr><td>9.</td><td colspan="6">Course Objectives<br>1. Enable students to understand fundamentals of Highway and Traffic Engineering and Highway Planning.<br><br>Course Learning Outcomes (CLO)<br>At the end of the semester students should be able to:<br><br>CLO1: Analyze traffic data and interpret for highway planning<br>CLO2: Understand the fundamentals of traffic engineering<br>CLO3: Know the fundamentals of highway engineering, design and construction<br>CLO4: Know the materials used for highway construction</td></tr>
<tr><td>10.</td><td colspan="6">Transferable Skills:<br>This course is expected the development of the following transferable skills:<br>a) Self-management – an ability to manage time and task<br>b) Learning skills<br>▪ An ability to learn both independently and co—operatively;<br>▪ An ability to use library skills, to find and organize information ;<br>▪ An ability to use a wide range of academic skills (research, analysis, synthesis etc.);<br>▪ An ability to identify and evaluate personal learning strategies.<br>c) Teamwork<br>▪ An ability to take responsibility and carry out agreed task;<br>▪ An ability to take initiative and lead other;<br>▪ An ability to identify and evaluate personal learning strategy.<br>d) Problem solving<br>▪ An ability to analyse;<br>▪ An ability to think laterally about a problem;<br>▪ An ability to identify strategy options;<br>▪ An ability to solve the problems</td></tr>
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| | e) Information technologies<br>▪ An ability to use specialist software where relevant to the discipline. |
| 11. | **Teaching-learning and assessment strategy**<br>A variety of leaching strategies are used throughout the course, including the following:<br>• Classroom Lessons; Lecturer and power point presentations<br>• Tutorial Session;<br>• Student-Lecturer Discussion<br>• Collaborative and Co-operative learn;<br>• Independent study.<br>**Assessment:**<br>**Coursework** **40%**<br>Assignment 5%<br>Quizzes 5%<br>Laboratory work 10%<br>Test 20%<br>**Examination** **60%**<br>**Total** **100%** |
| 12. | **Synopsis:**<br>This course covers the fundamental of the highway and traffic engineering. Students are introduced to the basic analysis and design of highway and fundamental of traffic engineering |
| 13. | **Mode of Delivery:**<br>Lectures;<br>Practical Session. |

| 14. | **Performance Criteria :** | | | | | | |
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| | 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:**<br><br>Familiar with the studies to be undertaken, analyze traffic data and interpret for highway planning | **Assignment**<br>**Quizzes**<br>**Laboratory work**<br>**Test**<br>**Examination** | **Fail to:**<br>• Know the different studies to be conducted for purpose of highway planning<br>• Know how to analyse traffic survey data | **Poor to:**<br>• Know the different studies to be conducted for purpose of highway planning<br>• Know how to analyse traffic survey data | **Satisfactory to:**<br>• Know the different studies to be conducted for purpose of highway planning<br>• Know how to analyse traffic survey data | **Good to:**<br>• Know the different studies to be conducted for purpose of highway planning<br>• Know how to analyse traffic survey data | • **Excellent to:**<br>• Know the different studies to be conducted for purpose of highway planning<br>• Know how to analyse traffic survey data |

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| | **CLO2**:<br><br>Understand the fundamentals of traffic engineering | **Assignment**<br>**Quizzes**<br>**Laboratory work**<br>**Test**<br>**Examination** | **Fail to:**<br><br>• To know the fundamental theory of traffic flow and management.<br>• Know the traffic studies, drivers behavior and interactions and statistics<br>• Know the fundamental theory of speed, flow and density relationships and applications in road performance analysis<br>• Know intersections and the design of traffic signalized system | **Poor to:**<br><br>• To know the fundamental theory of traffic flow and management.<br>• Know the traffic studies, drivers behavior and interactions and statistics<br>• Know the fundamental theory of speed, flow and density relationships and applications in road performance analysis<br>• Know intersections and the design of traffic signalized system | **Satisfactory to:**<br><br>• To know the fundamental theory of traffic flow and management.<br>• Know the traffic studies, drivers behavior and interactions and statistics<br>• Know the fundamental theory of speed, flow and density relationships and applications in road performance analysis<br>• Know intersections and the design of traffic signalized system | **Good to:**<br><br>• To know the fundamental theory of traffic flow and management.<br>• Know the traffic studies, drivers behavior and interactions and statistics<br>• Know the fundamental theory of speed, flow and density relationships and applications in road performance analysis<br>• Know intersections and the design of traffic signalized system<br>system | **Excellent to:**<br><br>• To know the fundamental theory of traffic flow and management.<br>• Know the traffic studies, drivers behavior and interactions and statistics<br>• Know the fundamental theory of speed, flow and density relationships and applications in road performance analysis<br>• Know intersections and the design of traffic signalized system |

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| | **CLO3:**<br><br>Know the fundamentals of highway engineering, design and construction | **Assignment**<br>**Quizzes**<br>**Laboratory work**<br>**Test**<br>**Examination** | **Fail to:**<br><br>• Know the different types of highway pavement – flexible and rigid<br>• Know the design of pavement thickness<br>• Know the geometric design of road profiles, vertical and horizontal curves<br>• Know the construction technique, plants, quality control and testing of pavement materials<br>• Know the design of highway drainage<br>• Understand the assessment, economic evaluation, maintenance and rehabilitation of road pavement | **Poor to:**<br><br>• Know the different types of highway pavement – flexible and rigid<br>• Know the design of pavement thickness<br>• Know the geometric design of road profiles, vertical and horizontal curves<br>• Know the construction technique, plants, quality control and testing of pavement materials<br>• Know the design of highway drainage<br>• Understand the assessment, economic evaluation, maintenance and rehabilitation of road pavement | **Satisfactory to:**<br><br>• Know the different types of highway pavement – flexible and rigid<br>• Know the design of pavement thickness<br>• Know the geometric design of road profiles, vertical and horizontal curves<br>• Know the construction technique, plants, quality control and testing of pavement materials<br>• Know the design of highway drainage<br>• Understand the assessment, economic evaluation, maintenance and rehabilitation of road pavement | **Good to:**<br><br>• Know the different types of highway pavement – flexible and rigid<br>• Know the design of pavement thickness<br>• Know the geometric design of road profiles, vertical and horizontal curves<br>• Know the construction technique, plants, quality control and testing of pavement materials<br>• Know the design of highway drainage<br>• Understand the assessment, economic evaluation, maintenance and rehabilitation of road pavement | **Excellent to:**<br>• Know the different types of highway pavement – flexible and rigid<br>• Know the design of pavement thickness<br>• Know the geometric design of road profiles, vertical and horizontal curves<br>• Know the construction technique, plants, quality control and testing of pavement materials<br>• Know the design of highway drainage<br>• Understand the assessment, economic evaluation, maintenance and rehabilitation of road pavement |

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| | **CLO4:**<br><br>Know the materials used for highway construction | **Assignment**<br>**Quizzes**<br>**Laboratory work**<br>**Test**<br>**Examination** | **Fail to:**<br><br>• Familiar with the different materials used for highway construction<br>• Know the bituminous materials and related tests<br>• Know Modified Asphalts and its application<br>• Know surface dressing and porous mixes<br>• Know concrete block pavements | **Poor to:**<br><br>• Familiar with the different materials used for highway construction<br>• Know the bituminous materials and related tests<br>• Know Modified Asphalts and its application<br>• Know surface dressing and porous mixes<br>• Know concrete block pavement | **Satisfactory to:**<br><br>• Know the bituminous materials and related tests<br>• Know the bituminous materials and related tests<br>• Modified Asphalts and its application<br>• Know surface dressing and porous mixes<br>• Know concrete block pavements | **Good to:**<br><br>• Know the bituminous materials and related tests<br>• Know the bituminous materials and related tests<br>• Know Modified Asphalts and its application<br>• Know surface dressing and porous mixes<br>• Know concrete block pavements | • **Excellent to:**<br><br>• Know the bituminous materials and related tests<br>• Know the bituminous materials and related tests<br>• Modified Asphalts and its application<br>• Know surface dressing and porous mixes<br>• Know concrete block pavements |

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 utilize systems approach to design and evaluate operational performance; | **PLO5:** Understanding of the principles of design for sustainable development; | **PLO6:** Understanding of professional ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer 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; | **PLO9:** Ability to function effectively in group with the capacity to be a leader or manager; | **PLO10:** Recognizing the need to undertake lifelong learning, and possessing /acquiring the capacity to do so; | **PLO11**: ability to become Entrepreneur; |
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| **PEO1:** To produce graduates with proficient knowledge and competency in various areas in Civil/Electrical/Mechanical 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 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; | Islamic values, social, cultural, global and environmental responsibilities of a professional | **PLO7:** Ability to communicate effectively, not only with engineers but also with the community at large; | **PLO8:** ability to function effectively as an individual; | **PLO9:** Ability to function effectively in group with the capacity to be a leader or manager; | **PLO10:** Recognising the need to undertake lifelong learning, and possessing /acquiring the capacity to do so; | **PLO11**: ability to become Entrepreneur; |
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| **CLO1:** Analyze traffic data and interpret for highway planning | ✓ | | | | | | | | | | |
| **CLO2:** Understand the fundamentals of traffic engineering | ✓ | | | | | | | | | | |
| **CLO3**: Know the fundamentals of highway engineering, design and construction | ✓ | ✓ | | | | | | | | | |
| **CLO4:** Know the materials used for highway construction | ✓ | ✓ | | | | | | | | | |

| 17. | Content outline of the course/module and the SLT per topic | | | | | | |
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| | | **Details** | **SLT (Hour)** | | | | |
| | | | **L** | **T** | **P** | **IS** | **Total** |
| | **Topic 1** | **Introduction to Highway Planning**<br>• Needs Study<br>▪ Impact Study<br>▪ Location study<br>▪ Feasibility study<br>• Data Gathering Principles<br>▪ traffic survey | 3 | - | - | 5 | **8** |
| | **Topic 2** | **Traffic Engineering**<br>• Traffic characteristic<br>▪ Traffic flow characteristics<br>▪ Speed and travel time<br>▪ Traffic volume and rate of flow<br>▪ Traffic density<br>• Traffic studies<br>▪ spot speed studies<br>▪ volume studies<br>▪ Travel time and delay study<br>▪ Parking studies<br>• Intersections<br>▪ At grade<br>▪ Grade separated<br>• Traffic control devices and system<br>▪ Traffic marking<br>▪ Design of traffic signalized system | 9 | - | - | 15 | **24** |

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| | **Topic 3** | **Highway Design**<br>• Highway capacity design<br>▪ Level of service<br>▪ Factor effecting capacity<br>• Preliminary design<br>▪ General location<br>▪ Basic functional and engineering solutions<br>▪ Right of way<br>• Route selection, alignment and survey<br>• Design speed and sight distances<br>▪ overtaking sight distances<br>▪ stopping sight distance<br>• Geometric design of highway<br>▪ Profile<br>▪ Cross sections<br>▪ Horizontal alignment<br>▪ Vertical alignment<br>• Preparation of final plans mass diagram<br>• Drainage design<br>• Junction / intersection design<br>▪ Roundabout intersections<br>▪ Signalized junction<br>▪ Interchange<br>• Pavement thickness design<br>▪ Flexible pavement<br>▪ Rigid pavement<br>• Design standard and criteria<br>▪ Design codes and standard | 15 | - | - | 25 | **40** |
| | **Topic 4** | **Highway Materials**<br>• Sub-formation soil types<br>▪ Soil properties<br>▪ Soil classification for highway purpose<br>▪ Moisture-density relationship<br>▪ CBR Tests<br>• Aggregates for subbase and capping<br>▪ Size, gradation, durability and specific gravity<br>▪ Resistance to water and weathering<br>• Materials for flexible pavement<br>▪ Bituminous materials<br>▪ Asphalts<br>▪ Aggregates<br>▪ Surface dressings and modified binders<br>• Materials for rigid pavement<br>▪ Concrete<br>▪ Joints<br>▪ Reinforcements<br>▪ Curing and skid resistance | 9 | - | - | 15 | **24** |

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| | **Topic 5** | **Highway Maintenance**<br>• Pavement maintenance<br>▪ Evaluation of Pavement conditions<br>▪ Deflections<br>▪ Slippages<br>▪ Cracks<br>▪ Surface correction<br>▪ Potholes<br>▪ Overlays<br>• Drainage maintenance<br>• Road shoulder maintenance<br>• Road furniture maintenance | 6 | - | - | 10 | **16** |
| | **Practical** | **Practical**<br>• Softening point determination<br>• Penetration test on bitumen<br>• Marshall stability test | - | - | 14 | - | **14** |
| | | **Total (Hour)** | **42** | **-** | **14** | **70** | **126** |
| 18. | **Main references supporting the course**<br>1. Highways the Location, Design, Construction & Maintenance of Pavements by O'Flaherty (Jan 1, 2006)<br>2. Traffic & Highway Engineering by Nicholas J. Garber and Lester A. Hoel (Jun 4, 2008)<br>3. Traffic & Highway Engineering - SI Version by Nicholas J. Garber and Lester A. Hoel (May 1, 2009 | | | | | | |
| | **Additional references supporting the course**<br>1. O flahorty C.A' highways- the location design and maintenance of road pavement 4th edition<br>2. Wright. P.H 1996 ' Highway Engineering ' Johm Wiley and Sans<br>3. Rogers. M 2003' An introduction of highway engineering Blackwell publication<br>4. Footprint Design Manual for Local Roads by The Local Roads and Streets Committee of the Transportation and Development Institute (Aug 18, 2010) | | | | | | |
| 19. | **Other additional information**<br>All materials will be available to the students in the library. | | | | | | |