FUNDAMENTALS OF ROADS AND PAVEMENTS - UNIT SPECIFICATION

Programs
Master of Pavement Technology (MPT) (AQF Level 9)
Graduate Certificate in Pavement Technology (GCPT)

Unit Name
Fundamentals of Roads and Pavements

Unit Code
CPE600

Duration
One semester

Credit Points
1

Delivery Mode
Online

Prerequisites
Nil

Co requisites
Road Construction and Drainage Principles

Unit Chair
David Hazell

Synopsis
This unit outlines the fundamental underpinning theories of road pavement materials, quality assurance, structural design, surfacing, asset management and pavement renewal. Students build on AQF Level 7/8 qualifications to acquire the overarching skills and knowledge essential for subsequent specialisation within pavement technology. Students will develop the ability to critical evaluate the importance of an efficient road system to the economic well-being of a country and appraise the key elements that determine the design and life of road pavements.

Unit Topics

Topic 1 - The Australian National Road Network
Topic 2 - Soil Mechanics and Road Pavements
Topic 3 - Quality Control and Assurance in Road Construction
Topic 4 - Pavement Types and Structures
Topic 5 - Unbound Granular Pavement Materials
Topic 6 - Stabilised Pavement Materials
Topic 7 - Bitumen Based Materials
Topic 8 - Introduction to Pavement Design
Topic 9 - Introduction to Pavement Maintenance and Renewal
Topic 10 - Introduction to Road Asset Management
Topic 11 - Introduction to Project and Contract Management
Unit Learning Outcomes (ULOs)

After completing this unit students will be able to:

1. Critically appraise the important micro and macroeconomic contributions of the road pavement network;
2. Evaluate the key factors affecting the structural behaviour of road pavements and compare and contrast road pavements under different operating environments through the application of fundamental elastic theories;
3. Differentiate between performance requirements for road construction projects, including applications of quality systems and sampling techniques;
4. Analyse the broad range of failure modes of materials and compare and contrast the wide spectrum of pavement materials to optimise road pavement performance through contemporary standards;
5. Appraise and optimises selection of flexible road pavements through material evaluation, application of semi-mechanistic design processes and example design charts;
6. Apply the broad principles of asset and project management to the road infrastructure to appraise and optimise whole of life performance.

Assessment Tasks and Weightings

To obtain a pass grade in this Unit 50% overall must be achieved and at least 40% achieved in the final examination.

Unit Assessment consists of three assignments and a final examination as summarised below. Students must also refer to the Assignments and the Unit Assessment Guide for Fundamentals of Roads and Pavements provided on the CPEELMS. Detailed information is provided for each Assessment Task.

Assignment 1 involves undertaking a critical review of the stresses generated by commercial vehicles within a pavement structure. An elastic approach is to be used through application of Boussinesq equations for stresses in an elastic half space, under surface loads. It is worth 20% of the total marks for the Unit.

Assignment 2 consists of two parts. The first part requires the statistical analysis and interpretation of road pavement subgrade data using the Normal Distribution. The task is related to the application of quality control in pavement construction through analyse and synthesise of data. The second part involves the critically analysis of soil data by application of soil compaction theory to recommend the preparation of a road subbase to meet specification limits. The assignment is worth 20% of the total marks for the Unit.

Assignment 3 requires the synthesis and critical analysis of complex data around available materials, cost information and future life to assess a number of pavement design options, in rural and urban locations, using the broad spectrum of example charts in the Austroads Pavement Structural Design Guide. It is worth 20% of the total marks for the Unit.

The Final Examination is of 2.5 hours duration consisting of two parts. Part A is compulsory. In Part B three questions are to be answered from four choices . The final exam is worth 40% of the total marks for the Unit.
Program Learning Outcomes for the MPT (PLOs)

The overarching objectives for the MPT is to graduate students who are skilled in the knowledge and application of pavement technology and who have the capacity to become outstanding professionals and leaders in the road engineering field. The MPT learning outcomes listed below contribute to achieving these outcomes.

1. The CPEE MPT graduate will have advanced knowledge across the design, construction and maintenance systems related to pavements and understand the impact of their engineering solutions in global and societal contexts.

2. Graduates will possess a thorough knowledge of the economic and environmental consequences of the implementation of pavement technology and how to implement this knowledge in their professional work by developing technical solutions to best benefit all stakeholders.

3. MPT graduates will be able to synthesise technical knowledge, undertake complex analysis and design in order to identify, formulate and solve problems of professional importance. They will be able to apply existing theories, methods and interpretations, and to work independently and within teams on practical and theoretical problems.

4. The graduate will be able to research and critically evaluate various sources of information using mathematical and computational tools and apply outcomes to structure and formulate professionally sound arguments and judgements. They will identify and utilise state of the art developments within pavement technology as well as apply relevant national and international standards.

5. Graduates will be able to research and apply knowledge, information and skills in new and emerging areas of road and pavement technology and its related fields, in order to carry out advanced assignments and projects and contribute to innovation in pavement technology.

6. Graduates will demonstrate the capacity to effectively communicate through multiple media and share knowledge at all levels including, with specialists, the engineering team and the general public.

CPEE Graduate Attributes

The CPEE Graduate Attributes underpin Programs that seek to graduate students who are thinkers, innovators, communicators, leaders and are socially, cultural, ethically and environmentally aware.

1. In-depth knowledge & skills in a discipline area: an in-depth knowledge within the field of study, based on current and emerging national and international practice.

2. Judgement, analysis and problem solving: the ability to define, analyse and create viable solutions to a range of problems and to reflect on potential outcomes.

3. Creativity and inventiveness: the ability to generate creative and innovative solutions to discipline and social challenges.

4. Effective communication and collaboration: the abilities to collaborate, communicate and present information and concepts clearly, fluently and within context to diverse audiences via multiple media.

5. Sustainability, socially and ethically focussed: the ability to respond appropriately to discipline issues with a commitment to sustainability, social and high ethical standards.

6. Information and digital literacy: the ability to recognise when information is needed and to locate, interpret, evaluate, and effectively use the information as required.

7. Lifelong learning to increase self-potential: the ability to pursue personal and work based development in a changing environment through self-managed learning.
Mapping Assessment to ULOs, PLOs and GAs

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<thead>
<tr>
<th>Assessment</th>
<th>Unit Learning Outcome</th>
<th>Program Learning Outcome</th>
<th>Graduate Attributes</th>
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<tbody>
<tr>
<td>Assignment 1</td>
<td>2</td>
<td>3,4</td>
<td>1,2,5</td>
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<tr>
<td>Assignment 2</td>
<td>3,4</td>
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<tr>
<td>Assignment 3</td>
<td>1,4,5,6</td>
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<td>1,2,6</td>
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<tr>
<td>Final Exam</td>
<td>1,2,3,5,6</td>
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Student Workload

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<th>Total</th>
<th>150 hours</th>
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<td>Assessment</td>
<td>30 to 50 hours</td>
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<tr>
<td>Directed Study</td>
<td>120 to 100 hours</td>
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Required Facilities

Students must have access to the internet, email and word processing and spreadsheet programs.

Prescribed Text(s)


Recommended Text(s)


Generic References

All students are advised to source material from the CPEE, “*Student Learning Resources Guidelines to Accessing Contemporary International Literature*”, available on the CPEELMS, which provides a rich library resource of seminal and contemporary scholarly publications. It is highly recommended that the sites are accessed where appropriate in the preparation of written assessment tasks.

Information Resources

Information resources are identified and made available throughout the various Topics, typically through web links.