Subject Description Form

Subject Code	AMA2131
Subject Title	Mathematics for Engineers
Credit Value	3
Level	2
Pre-requisite	AMA1130 Calculus for Engineers AMA1131 Calculus
Exclusion	Intermediate Calculus and Linear Algebra (AMA2007/AMA2707) Mathematics I (AMA2111) Mathematics for Engineers (AMA2308) Engineering Mathematics (AMA290)
Objectives	To acquire knowledge of engineering mathematics and to apply these tools for their feasible solution of practical problems in civil engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. apply mathematical reasoning to analyze essential features of different problems; b. apply the fundamentals of mathematics to formulate problems; c. apply such fundamentals to obtain solutions to problems formulated; d. critically analyze and interpret the models formulated and solutions obtained to support the synthesis of logical and cost-effective solutions; e. communicate solutions logically and lucidly through calculation, sketch, drawing and in writing.
Subject Synopsis/ Indicative Syllabus	1. Function of several variables, partial derivatives, chain rule for several independent variables, material derivatives, Taylor's formula and Taylor's series, stationary points, maxima, minima and saddle points. Applications to Optimization. 2. Multiple integration, double and triple integrals, change of variables and Jacobian, polar, cylindrical and spherical coordinates. Volume, Centroid and Moment of inertia of a solid. 3. Vector calculus (gradient, curl and divergence), scalar and vectors fields, line integrals, surface integrals, Stokes Theorem, Gauss

<table>
<tr><td></td><td>Divergence Theorem, and Green's Theorem. Applications to fluid flows.

4. Matrix calculation, system of linear equations, eigenvalues and eigenvectors, positive definite matrices and their basic properties, diagonalization of real symmetric matrices.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Emphasis is placed on a pro-active learning approach. Fundamental knowledge will be introduced in the lectures, with interspersed questions, exercises and quizzes for class discussion and after class self study. Students will be expected to read up, do exercises and reflect critically on the material covered in class. A companion web site-cum-discussion forum will be available to facilitate questioning and discussion. Additional face-to-face discussion sessions can be arranged on request.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1.Coursework</td><td>40</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Final Examination</td><td>60</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
</table>
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Coursework and Self Study</td><td>78 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
</table>
</td></tr>
</table>

Reading List and References	Kreyszig, E. Advanced Engineering Mathematics, 10th ed., Wiley, 2011. Zill, D.G. and Wright W.S. Advanced Engineering Mathematics, 5th ed., Sudbury, Mass. : Jones and Bartlett Publishers, 2014. Marsden, J.E. Basic Multivariable Calculus, 3rd ed., Springer Verlag, 2002. Chan, CK, Chan, CW, Hung KF Basic Engineering Mathematics, McGraw-Hill, 2015