COURSE CONTENT

Course Code & Title: CY1602 Mathematics II
Academic Unit: 4 AU
Pre-requisite: NIL

Content

Mathematics II serves as a second mathematics course for all CN Yang Scholars in year 1. This course covers:


**Calculus of Several variables:** Partial derivatives, limits and continuity, chain rule, directional derivatives, gradients, Lagrange multipliers. Double integrals, area of a surface, triple integrals. Vector calculus, line integrals, Green's Theorem, surface integrals, Gauss's divergence theorem, Stokes' Theorem.

Through the sample questions/exercises provided in the course material, the students can pick up fundamental principles for engineering science applications.

COURSE OUTLINE [Seminar: 39 hours, Discussion: 13 hours]

<table>
<thead>
<tr>
<th>S/N</th>
<th>Topic</th>
<th>Seminar and discussion hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Linear systems, matrix algebra, determinants, vectors in Euclidean n-space.</td>
<td>9+3</td>
</tr>
<tr>
<td>2.</td>
<td>Abstract vector spaces, subspaces, linear independence, rank, eigenvalues and eigenvectors, diagonalization, inner products, orthogonal systems, Fourier series, Gram-Schmidt process.</td>
<td>12+4</td>
</tr>
<tr>
<td>3.</td>
<td>Limits, continuity and differentiability of maps from $\mathbb{R}^n$ to $\mathbb{R}^m$, partial derivatives, constrained and unconstrained optimization of several variable functions.</td>
<td>9+3</td>
</tr>
<tr>
<td>4.</td>
<td>Double and triple integrals, line integrals and surface integrals. Gauss' Theorem, Green's Theorem, Stokes' Theorem.</td>
<td>9+3</td>
</tr>
</tbody>
</table>

Learning Outcome

Upon successful completion of the course, the students will be able to:
a. Understand and apply matrix and vector algebra to systems of linear equations and geometric problems.
b. Understand concepts of abstract vector spaces, subspaces, linear independence, basis, rank, eigenvalues and eigenvectors, diagonalization, inner products, orthogonal systems and Fourier series, Gram-Schmidt process.
c. Understand concepts of continuity and differentiability of maps between vector spaces.
d. Find critical points of a function of several variables and apply it to solve problems on optimization with or without constraints.
e. Integrate functions of functions of several variables and apply these techniques in physics and engineering problems.
f. Know several forms of Stokes' Theorem in $\mathbb{R}^3$.

**Textbooks**
- J. Stewart, Calculus
- H. Anton, Elementary Linear Algebra