Subject Description Form

Subject Code	AAE5001
Subject Title	Guidance, Navigation and Advanced Avionics System
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with the basic knowledge of guidance, navigation their application in advanced avionics systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. develop an understanding of basic concepts of guidance and navigation; b. understand the working principle of the state-of-the-art navigation systems used in aviation and aeronautical systems; c. apply the knowledge to design and develop advanced avionics systems.
Subject Synopsis/ Indicative Syllabus	**Inertial navigation**: the basic principles of inertial navigation; inertial sensors of accelerometer, gyro; inertial navigation algorithms. **Satellite navigation**: the principles of satellite navigation; receiver signal processing; stand-alone positioning and differential positioning. **Emerging navigation technology**: emerging sensors like lidar, camera; vision-based navigation. **Multi-sensor integration**: least squares estimation and Kalman filter; sensor fault detection and exclusion; performance of precision versus integrity under different scenarios. **Advanced avionics system**: applications in civil aviation, e.g., space-based augmentation system; ground-based augmentation system; receiver autonomous integrity monitoring.

Teaching/Learning Methodology

The teaching and learning methods include lectures and tutorials.

Lectures are aimed at providing students with an integrated knowledge required for understanding fundamental concepts in guidance, navigation and advanced avionics systems. Theories and examples will be presented to cover the syllabus.

Tutorials are aimed at enhancing the analytical skills of the students. Examples will be provided to teach students the skills of designing advanced guidance laws and avionics systems. Students will be able to solve real-life problems using the knowledge they acquired in the class.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Tutorial	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Homework	30%	√	√	√	√
2. Test	20%	√	√	√	√
3. Final examination	50%	√	√	√	√
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$$0.5 \times \text{Continuous Assessment} + 0.5 \times \text{Final Examination}$$

The continuous assessment consists of homework and test, which are aimed at evaluating the progress of students' study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The final examination is used to assess the knowledge acquired by the students for understanding and analysing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lecture	35 Hrs.
	▪ Tutorial	4 Hrs.
	Other student study effort:	
	▪ Self-learning	45 Hrs.
	▪ Homework	21 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Kabamba P.T. and Girard A.R., Fundamentals of Aerospace Navigation and Guidance, Cambridge Aerospace Series, 2014. 2. Nebylov A.V. and Watson J., Aerospace Navigation Systems. John Wiley & Sons, 2016. 3. Collinson R.P.G., Introduction to Avionics Systems, Springer, latest edition. 4. Tooley M, and Wyatt, Aircraft Electrical and Electronic Systems: Principles, Maintenance and Operation, Elsevier Ltd, latest edition.	

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