

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 knowledge of guidance theory, navigation systems and advanced avionics systems including communications, electronics and electrical aspects of avionics.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. develop an understanding of basic concepts in guidance, navigation and advanced avionics systems; b. apply the guidance theory to design advanced guidance system; c. understand the working principle of the state-of-the-art navigation systems used in aviation and aeronautical systems; and d. apply their knowledge, skills and hands-on experience to design, develop, manufacture, and analyse new products with advanced avionics systems for desired needs.
Subject Synopsis/ Indicative Syllabus	<p>Guidance: Guidance mission and performance; Guidance laws (LOS and PN guidance laws); Advanced guidance system design; Optimal guidance.</p> <p>Navigation: Inertial navigation (coordinate systems and transformation, attitude estimation and Euler angles, strapdown navigation system); Satellite navigation (GNSS and its augmentation systems (SBAS, ABAS, GBAS)); Terrestrial navigation (NDB, VOR, DVOR, DME, ILS & GP, radar altimeters & AID); Concept and implementation of PBN (LNAV & VNAV, LPV, RNP).</p> <p>Advanced avionics system: Airborne communications systems (VHF & HF transceivers, VDL modes; NAVCOM; EPIRB); Fly-by-wire flight control (FBW flight control features, safety and integrity, redundancy and failure survival, digital implementation and problems, flight control software functions); Aircraft integrated systems (Integrated system of substantially all aircraft attitude and flight path command and control parameters and mode annunciation for the flight director and automatic pilot systems, real time software and advanced distributed architectures).</p>

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	<ol style="list-style-type: none"> 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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