Visvesvaraya Technological University, Belgaum

Choice Based Credit System (CBCS)
Scheme of Teaching and Examination 2017-18
Of
M.Tech – Part Time.
IN

AVIONICS SYSTEMS

Dated April -2017
(Draft)

Visvesvaraya Technological University, Belgaum

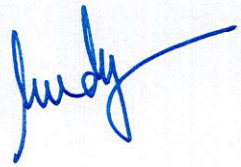
Choice Based Credit System (CBCS)

Scheme of Teaching and Examination 2017-18

M.Tech (Avionics Systems) – PT

First Semester Part Time (Part I)

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 11	Applied Mathematics	4	--	3	20	80	100	4
17 MAV 12	Aircraft Communication Systems and Standards	4	2	3	20	80	100	4
17 MAV 13	Fundamentals of Avionics	4	2	3	20	80	100	4
	Total	12	4	9	60	240	300	12



Visvesvaraya Technological University, Belgaum

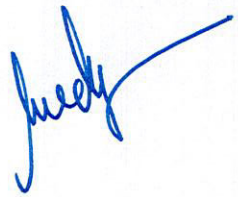
Choice Based Credit System (CBCS)

Scheme of Teaching and Examination 2017-18

M.Tech (Avionics Systems) - PT

Second Semester Part Time-(Part-I)

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 21	Flight Dynamics and Control	4	2	3	20	80	100	4
17 MAV 22	Aircraft Navigation Systems	4	2	3	20	80	100	4
17 MAV 23	Aircraft Display Systems	4	..	3	20	80	100	4
	Total	12	4	9	60	240	300	12



Visvesvaraya Technological University, Belgaum

Choice Based Credit System (CBCS)

Scheme of Teaching and Examination 2017-18

M.Tech (Avionics Systems) - PT

First Semester Part Time (Part II)

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 14	Flight Instrumentation & Flight Management Systems	4	2	3	20	80	100	4
17 MAV 15X	Elective - 1	3	2	3	20	80	100	3
17 MAV 16	Avionics System Lab-1	..	3	3	20	80	100	2
17 MAV 17	Seminar	..	3	..	100	..	100	1
Total		7	7	9	160	240	400	10

Elective – 1	
17 MAV 151	Aircraft System Engineering & Standards
17 MAV 152	Machine Learning Techniques
17 MAV 153	Artificial Intelligence & Agent Technology
17 MAV 154	Cloud Computing

Visvesv9araya Technological University, Belgaum

Choice Based Credit System (CBCS)
Scheme of Teaching and Examination 2017-18
M.Tech (Avionics Systems) - PT

Second Semester Part Time (Part II)

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 24	Aircraft Surveillance Systems	4	2	3	20	80	100	4
17 MAV 25X	Elective -2	3	2	3	20	80	100	3
17 MAV 26	Avionics System Lab-2	..	..	3	20	80	100	2
17 MAV 27	Seminar	..	3	..	100	..	100	1
Total		7	7	9	160	240	400	10

Elective – 2	
17 MAV 251	Embedded Computing Systems
17 MAV 252	Big Data
17 MAV 253	Unmanned Aerial Vehicles
17 MAV 254	Flight Data Sciences

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Choice Based Credit System (CBCS)

Scheme of Teaching and Examination 2017-18

M.Tech (Avionics Systems) - PT

III Semester

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 31	Seminar /Presentation on Internship*	..	..	..	25	..	25	20
17 MAV 32	Report on Internship**	..	..	..	25	..	25	
17 MAV 33	Evaluation and Viva –voce on Internship***	..	..	..	..	50	50	
17 MAV 34	Evaluation of Project Phase -I	..	..	..	50	..	50	1
Total		..	..	..	100	50	150	21

Note:

* The student shall make a midterm presentation of the activities undertaken during the first 8 weeks of internship to a panel comprising Internship Guide (Internal), a senior faculty from the department and HOD

** Internship report shall be submitted before the end of 18th week from the date of commencement of 5th semester and evaluated by the committee

*** The Viva Voce examination shall be conducted jointly by the Internship guide (Internal) and the external guide under whose supervision the student has carried out the internship.

Visvesvaraya Technological University, Belgaum

Choice Based Credit System (CBCS)

Scheme of Teaching and Examination 2017-18

M.Tech (Avionics Systems) - PT

IV Semester

Sub. Code	Name of the Subject	Teaching hours / week		Examination				Credits
		Theory	Practical/ Field work/ Assignment	Duration	IA Marks	Theory / Practical Marks	Total Marks	
17 MAV 41	Aircraft Propulsion, Utility Systems & Diagnostics	4	..	3	20	80	100	4
17 MAV 42x	Elective - 3	3	..	3	20	80	100	3
17 MAV 43	Evaluation of Project Phase -2	..	..	..	50	..	50	3
17 MAV 44	Evaluation of Project & Viva Voce	..	..	..	..	100 + 100	200	10
	Total	..	..	..	90	360	450	20
Grand Total: (From Ist to VIth semester): 2000								**85**

Elective – 3	
17 MAV 421	Fault Tolerant Systems
17 MAV 422	Mission Avionics
17 MAV 423	Flight Testing of Avionics Systems
17 MAV 424	Fuzzy Logic and Neural Networks

Note:

1. Project Phase-1: 6 week duration shall be carried out between 2nd and 3rd semester vacation. Candidates in consultation with guide shall carry out literature survey / visit industries to finalize the topic of project.

2. Project Phase – 2: 16 week duration during 4th semester. Evaluation shall be done by the committee constituted comprising HOD as Chairman, Guide and senior faculty of th department

3. Project Evaluation: Evaluation shall be taken up at the end of 4th semester. Project work evaluation and Viva Voce examination shall be conducted as follows:
4. Project Evaluation:
   a. Internal examiner shall carryout the evaluation for 100 marks
   b. External examiner shall carryout the evaluation for 100 marks
   c. The average of marks allotted by the internal and external examiner shall be the final marks of project evaluation
   d. Viva-Voce examination of project work shall be conducted jointly by internal and external examiner for 100 marks

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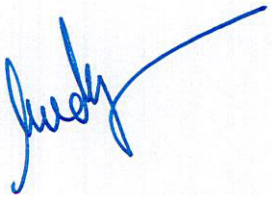

Applied Mathematics

Sub Code:	17 MAV 11	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	...	First Semester	16 weeks
Credits: 04			

Course Objectives: The objectives of this course is

- To introduce students to the mostly used analytical and numerical methods in the different engineering fields by making them
- To introduce students to learn Fourier series, Laplace transforms, Complex Analysis, Linear Algebra, Vector Integration, numerical methods
- To introduce students to solve algebraic and transcendental equations and Non-linear ordinary differential equations.

Module -I

Review of Fourier Series and Applications, Review of Laplace Transforms, and Applications, Eigen values and Eigen vectors. Classification of second order linear partial differential equations, Canonical forms for hyperbolic, parabolic and elliptic equations, Homogeneous and Non Homogeneous equations with constant coefficients.

Teaching Hours: 10; RBT Levels: L1,L2

Module-II

Vector Functions, General rules for differentiation, Velocity and Acceleration, Gradient of a scalar field, Directional Derivative, Properties of Gradient, Divergence of vector point function, Curl of a vector point function, Properties of Divergence and Curl. Integration of vector functions, Line integral, Circulation, Work done by a force, Surface integrals, Volume integrals, Divergence Theorem of Gauss, Green's Theorem in the plane, Stoke's Theorem, Problems on all the three theorems.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-III

Review of Complex analysis, Complex analysis applied to potential theory, Electrostatic fields, conformal mapping, Heat problems, Fluid flow, General properties of Harmonic functions, Complex Integration, Cauchy's Theorem, Cauchy's Integral Formula, Cauchy's Integral Formula for Derivatives, Taylor's and Laurent's series. Singular point, Residue, Method of finding Resides, Residue Theorem, Contour Integration.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-IV

Numerical Solutions algebraic and transcendental equations: Newton - Raphson method, Iteration method, Aitken's method, Solution of linear simultaneous equations. Gauss elimination method, Inverse of a matrix, Gauss-Seidal method, Crout's method. Solution of Ordinary Differential Equations: Taylor's Series method, Picard's method, Euler's method, Euler's Modified method, Runge-Kutta 4th order method.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-V

Finite differences, Interpolation, Newton's Forward & Backward Interpolation formulae, Lagrange's formula, Newton's Divided difference, Central difference formulae (all formulae with proof). Numerical Differentiation, Numerical Integration (all rules with proof).

Teaching Hours: 10; RBT Levels: L1,L2,L3

Course Outcomes: On completion of this course, students are able to:

1. Know the use of periodic signals and Fourier series to analyze circuits and system communications.
2. Solve Non-linear Partial differential equation
3. Employ appropriate numerical methods to solve algebraic and transcendental equations.
4. Apply Green's Theorem, Divergence Theorem and Stokes' theorem in various applications in the field of electro-magnetic and gravitational fields and fluid flow problems.
5. Employ appropriate numerical methods to solve Initial value problems.

Text Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons(Asia) Pvt. Ltd. 10th edition, 2010, ISBN 978-0-470-45836-5 .
2. H K Dass: Advanced Engineering Mathematics, S Chand and Company Ltd. 20th edition, 2015. ISBN, : 9788121903455

References

1. Bali and Iyengar: Engineering Mathematics, Laxmi Publications (P) Ltd. 6th edition, 2004.

Aircraft Communication Systems & Standards

Sub Code:	17 MAV 12	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	3	First Semester	16 weeks
Credits: 04			

Course Objectives:

- To refresh fundamentals of basis communication and study how that applies to Avionics Communications
- To analyze data communication & understand how it helps in networked systems
- To understand different aeronautical communication radios and data equipment in Aircraft and on ground
- To understand various buses and advanced communication methods in aircraft

Module-I

Basics of information theory, sampling and quantization, coding, modulation, signal detection and system performance in the presence of noise. Multiplexing Techniques – TDMA, FDMA and CDMA - Theory and Performance Fundamentals of Encryption – DES and Public Key Encryption. HF, VHF and SATCOM Antennas, Radiation pattern and Impedance.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-II

ISO OSI Model. Line Coding- RZ, NRZ, Manchester. Error detection and correction – Parity, ARQ, CRC, Reed Solomon coding. Communication protocols – HDLC, DSL, ADSL, Ethernet Communication, IEEE 802.3, Gigabit Ethernet, Wireless IEEE 802.11, Internet Protocols – IP, UDP, TCP/IP. AFDX, ARINC 664, CANBUS, TTP/C.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-III

Requirements of ATN – Data and Voice Communication. HF, VHF, SATCOM Systems – Basic Principles, Frequency Spectrum, Performance. Airborne and Land based segments. Functional block diagram of different communication systems in an aircraft and inter communication. ACARS – Requirements, Principles and Implementation. Principles of SW Defined Radios, Multi-Mode Receiver

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-IV

CMU - Requirements, HW Architecture, Interface Protocols, SW Requirements and SW Architecture. VHF Digital Radio - Mode – A,0,2,3 and 4 Requirements, Performance, HW and SW Architecture, SW requirements, Signal Processing

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-V

Satellite Communication - Geosynchronous Satellite, IMMARSAT for Aircraft Application, uplink and downlink, Transceiver Architecture. HF Communication - Performance, Ionospheric Propagation, Transceiver Architecture. Advanced communication techniques - LDACS, WiMAX, 4G Wireless, WAIC.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Course Outcomes:

- To propose and solve new communication needs in modern aircraft scenarios
- To make different communication equipment's interwork to deliver fast and content rich communication
- To visualize different components on radio and wired communications
- To come up with new data communication methods

Text Books

1. John G Proakis and Salehi. Communications Systems Engineering, Phi Publications, 2009, ISBN: 9788120327504,
2. Haykin. Communication Systems, John Wiley & Sons, Inc, 2000, ISBN 10: 0471178691

References:

1. A. Tanenbaum. Computer Networks. 1996.
2. Aircraft Communications Electronic Signaling System (SAE) by F. W Griffith
3. Alfred Helfrick, Principles of Avionics, Leesburg, VA: Avionics Communications, 2002.

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Fundamentals of Avionics

Sub Code:	17 MAV 13	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	...	First Semester	16 weeks
Credits: 04			

Course Objectives:

- To understand analyze Avionics System Requirements
- To understand evolution of Flight Deck Design
- To understand Federated and Integrated Avionics System Architectures involving MAU, LRMs and various digital Databus networks.
- To understand system assessment methods

Module-I:Avionics System Requirements & Flight Deck

Typical Standards and Agencies in civil and Military avionics, Mission oriented Avionics System Requirements – Design Drivers, Mission Analysis Techniques, Capturing Avionics Requirements - Top Down and Bottom; Safety Requirements, Human Factors Engineering, Modeling of HFE, Flight Deck Design – Philosophy, Automation & Situational Awareness,Evolution of Cockpit Instrumentation including HVGS

Teaching Hours: 10; RBT levels: L1,L2,L3

Module-II: Digital Avionics Data Bus Systems

Unidirectional and Bidirectional Data bus systems, Protocols, Topologies, Typical Avionics Data Buses: MIL-STD-1553B, ARINC-429, CSDB, CAN, ARINC-629, ASCB, AFDX;

Teaching Hours: 10; RBT levels: L1,L2,L3

Module-III: Avionics system architectures,

Evolution of Architectures, Types of System Architectures – Centralized, Distributed, Federated and Integrated Modular Avionics Architectures, MAU, LRM, GENESIS

Teaching Hours: 10; RBT levels: L1,L2,L3

Module-IV: Matching Avionics to Aircraft

Standardization of Avionics Packaging- LRU, ARINC and DOD types, system cooling, EMI/EMC requirements. Aircraft powers systems: Electrical power generation & distribution systems. Civil and Military Electrical Power requirement standards, comparing the Military and Civil Requirements and Tips for Power System Design,

Teaching Hours: 10; RBT levels: L1,L2,L3

Module-V: System Assessment Maintainability and Reliability

Hardware assessment, Fault Tree Analysis (FTA), Failure Mode and Effect Analysis(FMEA), Criticality and damaging modes and effects analysis. Avionics Software Technologies, Assessment and Validation – standards, Evolution of Automatic Test Equipment for maintenance, Evolution of Test Language – ATLAS; Introduction to Reliability.

Teaching Hours: 10; RBT levels: L1,L2,L3

Course Outcomes:

- To apply System requirement analysis methods for decomposition of functions among systems and sub systems
- To build message structures using databus concepts and to evolve conceptual avionics system architectures
- To evolve avionics test bench architecture
- To appreciate importance of HFE in Flight Deck Design and automation

Text Books

1. RPG Collinson., 'Introduction to Avionics Systems', Third edision, Springer, 2013, ISBN 978-94-007-0707-8
2. Ian Moir and Allan Seabridge., 'Civil Avionics Systems', AIAA Education Series, 2002. ISBN: 978-1-118-34180-3.

References

1. Spitzer, C.R. 'Digital Avionics Systems- Principles and Practice', The Blackburn Press, N.J., U.S.A., 2000.
2. Len Buckwalter., 'Avionics Databuses', published by Avionics Communications, 2008
3. Cary R. Spitzer, Digital Avionics Handbook, CRC Press, 2007.ISBN 0 -8483-8441-9

Flight Dynamics & Control

Sub Code:	17 MAV 21	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	3	Second Semester	16 weeks
Credits: 04			

Course Objectives:

- To understand lateral and longitudinal equations of motion of aircraft
- To analyze different modes in longitudinal and lateral motions
- To analyze stability in frequency domain
- To understand various types of AFCS functions and conceptual design methods

Module-I: Flight Dynamics

Review of Basic Flight Fundamentals: Aircraft Axes system, Different Forces and Moments acting on an aircraft and their coefficients

Introduction to Rigid body Dynamics, Aircraft's Motion, Forces and Moments Equations, Equation of motion, Eulers and Hamilton, Linearization, Non Dimensional forms, Rotary Derivatives

Laplace Transformation, Frequency Response and Root locus, Introduction to linearized and small-perturbation methods of analysis.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-II: Modeling of Aircraft Motions

Modeling of Aircraft with aerodynamic forces, State space and transfer function representation of dynamical systems, Linearization, Nonlinear model of flight vehicle dynamics, Linear model of flight vehicle dynamics, Modes and dynamic behavior of linear systems, Flight vehicle modes: phugoid, short period, dutch roll, roll and spiral, handling qualities.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-III: Steady State Stability and control

Stability (Static and Dynamic), Performance and figures of merits of aircraft: CP and CG, Wind, Body, Stability and Principal Axes, Stability augmentation, control augmentation and Stability Boundaries and parameters affecting them. Longitudinal, Lateral and roll Stability: Necessary conditions and Stability Margins

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-IV: Aircraft Controls

Introduction to Aircraft Controls systems: Direct Control, Hydraulic Powered and Power Assisted Controls, AFCS, Fly-By-Wire. High Mach Number Difficulties, Trim changes due to compressibility, Transonic Pitchup
Aircraft Flight control laws, redundancy requirements and envelop protection, MATLAB simulation of Lateral / Longitudinal Control of an aircraft. Frequency response of airplane – atmospheric disturbances and their effects on flight.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module–V: FCS - Design orientation

Types of FCS, Classification of A/C, Flight Envelopes, Flight Phases, HQ ratings, Reliability Requirements, Governing Regulations and Standards, Need for AFCS, Aircraft Motion sensors and airdata systems for AFCS, Types of Actuation Systems- Electro hydraulic and Electromechanical, Artificial Feel Systems, Typical Operating modes of AFCS, Typical AFDS Architectures, Coupling of AFDS with primary FCS, Control law implementation in digital domain, Integration and evaluation of AFCS on ground using HIL simulation facility, Some examples of AFDS /FBW

Teaching Hours: 10; RBT Levels: L1,L2,L3

Course Outcomes:

- To represent aircraft equations of motion in SS and TF form
- To analyze stability characterizes of longitudinal and lateral motions
- To analyze AFCS functions in time and frequency domain

Text Books:

1. Bernard Etkin, 'Dynamics of Flight: Stability and Control', Wiley India, 2011, ISBN 13: 9780471089360
2. Jan Roskam., 'Airplane flight dynamics and automatic flight controls, Part-I', DAR Corp, 2003

References:

1. Brian LS and Frank LL., 'Aircraft Control and Simulation', Wiley India, 2010
2. Introduction to Aircraft Flight Mechanics: Performance, Static Stability, Dynamic Stability, and Classical Feedback Control, AIAA Education Series, by Thomas R. Yechout, Steven L. Morris, David E. Bossert, Wayne F. Hallgren
3. Aircraft systems: mechanical, electrical, and avionics subsystems integration By Ian Moir, Allan Seabridge, 3rd Edition, 2008

Aircraft Navigation Systems

Sub Code:	17 MAV 22	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	3	Second Semester	16 weeks
Credits: 04			

Course Objectives:

- To understand various types of aircraft navigation systems and initialization requirements
- To analyze different types of navigation errors and correction methods
- To understand working principles of GPS navigation, signal in space requirements and message structures
- To analyze different types of navigation errors and correction methods

Module –I: Inertial Sensors & Inertial Navigation

Gyroscopes-Mechanical-electromechanical-Ring Laser gyro- Fibre optic gyro, Accelerometers. INS components and errors-The earth in inertial space, the coriolis effect- Mechanisation. Stabilized Platform and Strap down INS system, block diagrams, Different co-ordinate systems, Schuler loop, compensation errors, Cross coupling, Gimbal lock, Alignment.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-II: Radio Navigation

Different types of radio navigation- ADF, VOR/DME- Doppler -LORAN and Omega

Teaching Hours: 10

Module-III: Approach and Landing aids

ILS, MLS, GLS, Ground controlled approach system, surveillance systems, radio altimeter

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module –IV: Satellite Navigation

Introduction to GPS - system description - basic principles - position and velocity determination-signal structure, Augmented GPS including WAAS and GBAS.

Teaching Hours: 10; RBT Levels: L1,L2,L3

Module-V: Hybrid Navigation

Introduction to Kalman filtering-Estimation and mixed mode navigation-Integration of GPS and INS-utilization of navigation systems in aircraft

Teaching Hours: 10; RBT Levels: L1,L2,L3

Course Outcomes:

- To determine performance metrics of different navigation systems
- To build message structures for GPS navigation
- To be able to parse the raw binary data files of GPS navigation

Text Books:

1. Myron K and Walter R Fred., 'Avionics Navigation Systems', Wiley India, 2010, ISBN:978-81-265-2400-6
2. RPG Collinson., 'Introduction to Avionics', Springer, 2013, ISBN:978-81-322-1346-8

References

1. Nagaraja, N.S. "Elements of Electronic Navigation", Tata McGraw-Hill Pub. Co., New Delhi, 1975.
2. Sen, A.K. & Bhattacharya, A.B. "Radar System and Radar Aids to Navigation", Khanna Publishers, 1988.
3. Myron Kyton, Walfred Fried, 'Avionics Navigation Systems', John Wiley & Sons, 1997

Aircraft Display Systems

Sub Code:	17 MAV 23	IA Marks	20
No. of Lecture Hours /week	04	Exam Hours	03
Total No of Lecture Hours	50	Exam Marks	80
Practical work/Assignment, Hrs/wk	3	Second Semester	16 weeks
Credits: 04			

Course Objectives:

- To understand principles and evolution of cockpit display systems
- To acquire knowledge on functional aspects of various cockpit display instruments and control panels
- To understand computer graphics for cockpit displays

Module–I: Display Technologies

Trends in display technology – Alphanumeric displays, character display etc. Basic components of display systems. CRT displays, Plasma display, Solid state displays, LCDs and their characteristics.

Lecture Hours: 8; RBT Levels: L1,L2,L3

Module-II: Cockpit Displays – Functional View

Head up displays – Basic principles – Holographic HUDs - HUD electronics – HUD design and display generation. Helmet mounted displays – Helmet design factor – Helmet mounted sights – Head tracking system. Head down displays – Raster overlay display generation – Digitally generated color map displays. Multifunction displays – control and data entry – Multifunction keyboards- voice interactive systems.

Lecture Hours: 8; RBT Levels: L1,L2,L3

Module-III: Display Processor Requirements & Architecture

Concepts – Role of display processor – Design steps – Hardware architecture and Building blocks – Software Architecture – Symbol Generator –Display drive circuits – Display management Processor, Arinc 661 standards

Lecture Hours: 10; RBT Levels: L1,L2,L3

Module- IV: Computer Graphics

Vector generation display processors, Raster graphics, Graphic algorithms for generation of primitives, Display files, File compiler, Two and three dimensional transformation, clipping and windowing, Hidden line and hidden surface algorithms.

Lecture Hours: 12; RBT Levels: L1,L2,L3

Module-V: Graphics Standards

Graphic standards – 2D standards, 3D standards, X- Windows and their Application methods

Lecture Hours: 12; RBT Levels: L1,L2,L3

Course Outcomes:

- To apply solve system interface requirements with Pilot in Loop
- To evolve cockpit display system architectures
- To generate symbologies and widgets using computer graphics

Text Books

1. Malcolm Jukes., 'Aircraft Dsiplay Systems', Wiley Series in Aerospace, 2014
2. Giloi W.K. "Interactive Computer Graphics, Data Structures, Algorithms, Languages", Prentice – Hall, 1988.

References:

1. W.M.Newman And R.F. Sproul - Principles Of Interactive Computer Graphics, McGraw - Hill, 1981
2. Davis, Computer Displays, Prentice – Hall, 1982.
3. R.B.G. Collinson – Introduction to Avionics, 3rd Edition, Springer, 2013.
4. Cary R. Spitzer, The Avionics Handbook, CRC Press, 2000.