Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as deemed to be university under section 3 of UGC Act 1956, vide notification No.F.9-5/2000-U.3)

B. Tech. – AEROSPACE ENGINEERING

(FULL TIME)

CURRICULUM

Regulation 2018

DEPARTMENT OF AERONAUTICAL ENGINEERING

FACULTY OF ENGINEERING AND TECHNOLOGY

BHARATH INSTITUTE OF SCIENCE AND TECHNOLOGY

 # 173, Agaram Road, Selaiyur,

Chennai -600 073, Tamil Nadu.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

B. TECH. - AEROSPACE ENGINEERING

(FULL TIME)

DEPARTMENT VISION

Department of Aeronautical Engineering will endeavour to accomplish worldwide recognition with a focal point of Excellence in the field of Aeronautics by providing quality Education through world class facilities, enabling graduates turning out to be Professional Experts with specific knowledge in Aeronautical & Aerospace engineering.

DEPARTMENT MISSION

- To be the state of art Teaching and Learning centre with excellent infrastructure and empowered Faculties in Aeronautical & Aerospace Engineering.
- To foster a culture of innovation among students in the field of Aeronautics and Aerospace with updated professional skills to enhance research potential for sponsored research and innovative projects.
- To Nurture young individuals to be knowledgeable, skilful, and ethical professionals in their pursuit of Aeronautical & Aerospace Engineering.

B. Tech. - Aerospace Engineering

Program Educational Objectives (PEOs)

PEO 1: Demonstrate a solid grasp of fundamental concepts in Mathematics, Science, and Engineering, essential for effectively addressing engineering challenges within the Aerospace industry.

PEO 2: Involve in process of designing, simulating, fabricating, testing, and evaluating in the field of Aerospace.

PEO 3: Obtain advanced skills to actively engage in research and development endeavors within emerging domains, while also pursuing further education opportunities.

PEO 4: Demonstrate efficient performance both as independent contributors and as valuable team members in diverse multidisciplinary projects.

PEO 5: Embrace lifelong learning and career advancement while adapting to the evolving social demands and needs.

B. Tech. - Aerospace Engineering

Program Outcomes (POs)

PO1- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2- Problem analysis: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.

PO3- Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4- Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5- Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6- The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7- Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9- Individual and teamwork: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PO10- Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.

PO11- Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12- Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. Tech. - Aerospace Engineering

Program Specific Outcomes (PSOs)

PSO1: Create, Select, and Apply aerospace modelling, analysis, and design, as well as team working skills in the design and integration of Spacecraft systems.

PSO2: Apply principles of aerodynamics, space propulsion, aerospace structures and control systems to design and analyze aircraft and spacecraft with desired performance characteristics.

B. Tech. - Aerospace Engineering

CURRICULUM STRUCTURE AND CREDITS DISTRIBUTION

Sl. No.	Course Category	Category Code	Minimum Credit Required	Weightage Percentage
1	Humanities and Social Sciences including Management courses	HS	9	5.3
2	Basic Science courses on Mathematics, Physics, Chemistry, Biology	BS	34	20.0
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer	ES	26	15.3
4	Program (Professional) Core courses (Compulsory courses)	PC	57	33.5
5	Program (Professional) Elective courses (Optional courses relevant to chosen specialization)	PE	18	10.6
6	Open Elective courses (Optional courses from other technical and/or emerging subjects)	OE	11	6.5
7	Project work (Project I and II)	PR	12	7.1
8	Employability Enhancement courses including Seminar, Comprehension, Term Paper and Internship in industry or HEI	EE	3	1.8
9	Mandatory Courses - Lecture Based (non-credit)	MCTH	0	0
10	Mandatory Courses- Activity Based (non-credit)	MCAB	0	0
Total			**170**	**100 %**

B. Tech. - Aerospace Engineering

CURRICULUM (R-2018)

I – VIII SEMESTERS

SEMESTER I								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN101	HS	Communicative English	3	3	0	0	3
2	U18BSMA101	BS	Engineering Mathematics –I	4	3	1	0	4
3	U18BSPH101	BS	Waves and Optics	3	3	0	0	3
4	U18BSCH101	BS	Engineering Chemistry	3	3	0	0	3
5	U18ESCS101	ES	Problem Solving and Python Programming	3	3	0	0	3
6	U18ESME101	ES	Engineering Graphics & Design	3	3	0	0	3
PRACTICAL								
7	*U18BSPH2L1	BS	Wave Optics and Mechanics Lab	2	0	0	2	0
8	*U18BSCH2L4	BS	Chemistry Lab	2	0	0	2	0
9	U18ESCS1L1	ES	Problem Solving and Python Programming Laboratory	4	0	0	4	2
ACTIVITY BASED COURSES								
10	U18MCAB101	MCAB	Physical health – Sports & Games	2	0	0	2	0
11	U18MCAB102	MCAB	Gardening & Tree Plantation	2	0	0	2	0
TOTAL				**31**	**18**	**1**	**12**	**21**

***Laboratory Classes will be conducted on alternative weeks for Physics and Chemistry.**

The Lab Practical Examinations will be held only in the second semester (including the first semester experiments).

SEMESTER II								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSEN201	HS	Technical English	3	3	0	0	3
2	U18BSMA201	BS	Engineering Mathematics- II	4	3	1	0	4
3	U18BSPH201	BS	Introduction to Mechanics	3	3	0	0	3
4	U18BSCH201	BS	Environmental Sciences	3	3	0	0	3
5	U18BSBT201	BS	Biology for Engineers	2	2	0	0	2
6	U18ESEE101	ES	Basic Electrical and Electronics Engineering	3	3	0	0	3
PRACTICAL								
7	*U18BSPH2L1	BS	Wave Optics and Mechanics Lab	2	0	0	2	2*
8	*U18BSCH2L4	BS	Chemistry Lab	2	0	0	2	2*
9	U18ESME1L2	ES	Workshop / Manufacturing Practices Laboratory	5	1	0	4	3
10	U18ESEE1L3	ES	Basic Electrical and Electronics Engineering Laboratory	4	0	0	4	2
ACTIVITY BASED COURSES								
11	U18MCAB203	MCAB	Yoga	2	0	0	2	0
12	U18MCAB204	MCAB	Physical health – NCC	2	0	0	2	0
TOTAL				**35**	**18**	**1**	**16**	**27**

***Laboratory Classes will be conducted on alternative weeks for Physics and Chemistry.**
The Lab Practical Examinations will be held only in the second semester (including the first semester experiments).

SEMESTER III								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18BSMA302	BS	Partial Differential Equations, Probability and Statistics	4	3	1	0	4
2	U18PCAS301	PC	Introduction to Aerospace Engineering	2	2	0	0	2
3	U18PCAS302	PC	Applied Dynamics and Vibration	3	3	0	0	3
4	U18ESAS301	ES	Fundamentals of Fluid Mechanics	3	3	0	0	3
5	U18ESAS302	ES	Fundamentals of Aero – Thermodynamics	3	3	0	0	3
6	U18ESAS303	ES	Fundamentals of Structural Mechanics	3	3	0	0	3
PRACTICAL								
7	U18PCAS3L1	PC	Strength of Materials Laboratory	2	0	0	2	1
8	U18PCAS3L2	PC	Computer Aided Design and Drafting Laboratory	2	0	0	2	1
9	U18ESAS3L1	ES	Fluid Mechanics and Machinery Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
10	U18MCAB305	MCAB	Culture- Learning an art form	2	0	0	2	0
11	U18MCAB306	MCAB	Culture – Intangible Cultural, heritage(festivals, Food ways, Local games)	2	0	0	2	0
TOTAL				**28**	**17**	**1**	**10**	**21**

SEMESTER IV								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18BSMA401	BS	Numerical Methods	4	3	1	0	4
2	U18PCAS401	PC	Elements of Aerospace Structures	3	3	0	0	3
3	U18PCAS402	PC	Aerodynamics	3	3	0	0	3
4	U18PCAS403	PC	Air breathing Propulsion	3	3	0	0	3
5	U18PCAS404	PC	Aerospace Materials	2	2	0	0	2
6	U18PCAS405	PC	Manufacturing Technology	3	3	0	0	3
7	U18MCTH401	MCTH	Constitution of India	2	2	0	0	0
PRACTICAL								
8	U18PCAS4L1	PC	Aerodynamics Laboratory	2	0	0	2	1
9	U18PCAS4L2	PC	Manufacturing Technology Laboratory	2	0	0	2	1
10	U18PCAS4L3	PC	Introduction to MATLAB	2	0	0	2	1
ACTIVITY BASED COURSES								

11	U18MCAB407	MCAB	Literature & Media – Literature, Cinema & Media	2	0	0	2	0
12	U18MCAB408	MCAB	Literature & Media – Group Reading of Classics	2	0	0	2	0
TOTAL				**30**	**19**	**1**	**10**	**21**

SEMESTER V								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCAS501	PC	Aerospace Structural Mechanics	3	3	0	0	3
2	U18PCAS502	PC	Compressible Flow	3	3	0	0	3
3	U18PCAS503	PC	Rocket Propulsion	3	3	0	0	3
4	U18PCAS504	PC	Aircraft Performance	3	3	0	0	3
5	U18PCAS505	PC	Aircraft Stability and Control	3	3	0	0	3
6	U18PEAS5E1	PE	Professional Elective – I	3	3	0	0	3
7	U18MCTH502	MCTH	Universal Human Values	2	2	0	0	0
PRACTICAL								
8	U18PCAS5L1	PC	Aircraft Structures Laboratory	2	0	0	2	1
9	U18PCAS5L2	PC	Gas Dynamics Laboratory	2	0	0	2	1
10	U18PCAS5L3	PC	Flight Simulation Laboratory	2	0	0	2	1
ACTIVITY BASED COURSES								
11	U18MCAB611	MCAB	Self-Development – Spiritual, Mindfulness & Meditation	2	0	0	2	0
12	U18MCAB612	MCAB	Self-Development - religion and Inter-faith	2	0	0	2	0
TOTAL				**30**	**20**	**0**	**20**	**21**

SEMESTER VI								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18HSBA601	HS	Organizational Behavior for Engineers	3	3	0	0	3
2	U18PCAS601	PC	Finite Element Analysis	3	3	0	0	3
3	U18PCAS602	PC	Heat Transfer	3	3	0	0	3
4	U18PEAS6E2	PE	Professional Elective – II	3	3	0	0	3
5	U18OEAS6E1	OE	Open Elective – I	3	3	0	0	3
6	U18MCTH603	MCTH	Essence of Indian Knowledge Tradition	2	2	0	0	0
PRACTICAL								
7	U18PCAS6L1	PC	Computer Aided Analysis Laboratory	2	0	0	2	1
8	U18PCAS6L2	PC	Propulsion Laboratory	2	0	0	2	1
9	U18EEAS6L1	EE	Aircraft Design Project	4	0	0	4	2
ACTIVITY BASED COURSES								

10	U18MCAB509	MCAB	Social Services – Social Awareness	2	0	0	2	0
11	U18MCAB510	MCAB	Social Services – NSS	2	0	0	2	0
TOTAL				**29**	**17**	**0**	**12**	**19**

SEMESTER VII								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PCAS701	PC	Guidance and Control	3	3	0	0	3
2	U18PCAS702	PC	Satellite Technology	3	3	0	0	3
3	U18PEAS7E3	PE	Professional Elective – III	3	3	0	0	3
4	U18PEAS7E4	PE	Professional Elective – IV	3	3	0	0	3
5	U18PEAS7E5	PE	Professional Elective – V	3	3	0	0	3
6	U18OEAS6E2	OE	Open Elective – II	3	3	0	0	3
PRACTICAL								
7	U18PCAS7L1	PC	Satellite Design Laboratory	2	0	0	2	1
8	U18PRAS7P1	EE	Project Phase I	6	0	0	6	3
ACTIVITY BASED COURSES								
9	U18MCAB713	MCAB	Behavioral and Interpersonal Skills	2	0	0	2	0
10	U18MCAB714	MCAB	Nature – Nature club	2	0	0	2	0
TOTAL				**30**	**18**	**0**	**12**	**22**

SEMESTER VIII								
Sl. No.	**Code No.**	**Category**	**Course Title**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	U18PEAS7E6	PE	Professional Elective – VI	3	3	0	0	3
2	U18OEAS6E3	OE	Open Elective – III	2	2	0	0	2
3	U18OEAS6E4	OE	Open Elective – IV	3	3	0	0	3
PRACTICAL								
4	U18PRAS8P2	EE	Project Phase II	18	0	0	18	9
5	U18EEAS8C1	EE	Comprehension	2	0	0	2	1
ACTIVITY BASED COURSES								
5	U18MCAB815	MCAB	Innovation – Project based – Sc., Tech, Social, Design & Innovation	2	0	0	2	0
TOTAL				**30**	**8**	**0**	**22**	**18**

Total No. of Contact Hours : 243

Total No. of Credits : 170

LIST OF PROGRAM ELECTIVES

List of Program (Professional) Elective(PE) I:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS011	Aerospace	Space Mission Design and Analysis	3	0	0	3
U18PEAS012	Aerospace	Systems Engineering	3	0	0	3
U18PEAS013	Aerodynamics	Launch Vehicle Aerodynamics	3	0	0	3
U18PEAS014	Aerodynamics	Boundary Layer Theory	3	0	0	3

List of Program (Professional) Elective (PE)II:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS021	Structures	Theory of Elasticity	3	0	0	3
U18PEAS022	Aerospace	Manned Space Missions	3	0	0	3
U18PEAS023	Propulsion	Electric Propulsion	3	0	0	3
U18PEAS024	Propulsion	Spacecraft Power Systems	3	0	0	3

List of Program (Professional) Elective (PE) III:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS031	Aerodynamics	Hypersonic Aerodynamics	3	0	0	3
U18PEAS032	Structures	Vibrations and Elements of Aero elasticity	3	0	0	3
U18PEAS033	Aerospace	Space Vehicle Design	3	0	0	3
U18PEAS034	Renewable Energy	Solar Thermal Energy	3	0	0	3

List of Program (Professional) Elective (PE) IV:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS041	Propulsion	Introduction to Combustion	3	0	0	3
U18PEAS042	Structures	Theory of Plate and shell	3	0	0	3
U18PEAS043	Aerospace	Spacecraft Attitude Dynamics and Control	3	0	0	3
U18PEAS044	Aerodynamics	High Temperature Gas Dynamics	3	0	0	3

List of Program (Professional) Elective (PE) V:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS051	Aerospace	Space Flight Mechanics	3	0	0	3
U18PEAS052	Structures	Experimental Stress Analysis	3	0	0	3
U18PEAS053	Avionics	Automatic Control	3	0	0	3
U18PEAS054	Aerodynamics	Computational Fluid Dynamics	3	0	0	3

List of Program (Professional) Elective (PE) VI:

Code No.	Specialization	Course Title	L	T	P	C
U18PEAS061	Propulsion	Cryogenic Rocket Propulsion	3	0	0	3
U18PEAS062	Materials science	High Temperature Materials	3	0	0	3
U18PEAS063	structures	Structural Dynamics	3	0	0	3
U18PEAS064	Aerospace	High Temperature Problems In Aerospace Structures	3	0	0	3

LIST OF OPEN ELECTIVES COMMON TO ALL B. Tech. PROGRAMMES

ALL THE COURSES WITH L=3, T=0, P=0 & C=3

1. U18OEBA001 Sociology
2. U18OEBA002-Lean Six Sigma
3. U18OEBA003-Cyber Law and Ethics
4. U18OEBA004-Economic Policies in India
5. U18OEBA005-Management Information System
6. Total Engineering Quality Management
7. U18OEBA007-Industrial Psychology
8. U18OEBA008-Entrepreneurship Development and IPR
9. U18OEBA009-Intellectual Property Rights
10. U18OEBA010-Engineering Economics and Cost Analysis
11. U18OEEN001- Soft Skills and Interpersonal Communication
12. U18OEEN002-Indian Writing in English
13. U18OEEN003-Creative Writing
14. U18OEEN004- Proficiency in English and Accent Training
15. U18OEMA001-Cryptography
16. U18OEMA002-Finite Automata Theory / Formal Languages
17. U18OEMA003-Linear Programming
18. U18OECE001 - Metro Systems and Engineering
19. U18OECE002-Pollution Regulations
20 U18OECE003-Road Safety
21. U18OECE004- Infrastructure Development
22. U18OECE005- Project Safety Management
23. U18OECE006- Environment, Health and Safety in Industries
24. U18OEME001-Design for Manufacturing and Assembly
25. U18OEME002Industrial Safety
26. U18OEME003-Refrigeration and Cryogenics
27. U18OEME004- Product Design and Development
28. U18OEAU001-Electric and Hybrid Vehicles
29. U18OEAU002-Intelligent Transportation System
30. U18OEAU003-Vibration and Noise Control
31. U18OEAU004-Automotive Sensors and Applications
32. U18OEMT001-MEMS and Nano Technology
33. U18OEMT002-Non-Destructive Testing
34. U18OEMT003-Bio Mechatronics
35. U18OEMT004-Artificial Intelligence for Robotics
36. U18OEAE001-Industrial Aerodynamics
37. U18OEAE002- Elements of Aeronautics and Astronautics
38. U18OEAE003- Unmanned Aerial Vehicle
39. U18OEAE004- Introduction to Avionics
40. U18OEAE005-Rocket Propulsion
41. U18OEEE001-Green Technologies
42. U18OEEE002-Electrical Safety and Quality Assurance

43. U18OEEE003-Energy Conservation Techniques
44. U18OEEE004-PLC and SCADA for Industrial
45. U18OEEC-001-Communication Systems
46. U18OEEC-002-VLSI circuits
47. U18OEEC-003-Image Processing Techniques
48. U18OEEC-004-Communication Networks
49. U18OEEC-005-An Introduction to DSP
50. U18OEEC-006-Basics of IoT
51. U18OEBM001-Medical Radiation Safety Engineering
52. U18OEBM002-Medical Waste Management
53. U18OEBM003-Quality Control in Healthcare
54. U18OEBM004-Wearable Technology
55. U18OEEI001-Analytical Methods and Instrumentation
56. U18OEEI002-Introduction to process Data Analytics
57. U18OEEI003-Reliability and Safety in Process industries
58. U18OEEI004-Multi sensor data fusion
59. U18OEBT001- Bioprocess Economics & Plant Design
60. U18OEBT002-Brewing technology
61. U18OEBT003-Biomining
62. U18OEBT004-Industrial Safety Engineering
63. U18OEAC001-Geo- informatics for Precision Farming
64. U18OEAC002-Livestock and poultry management
65. U18OEAC003-Extension methodologies and transfer of Agricultural Technologies
66. U18OEAC004-Soil and Water Conservation Engineering
67. U18OEIT001-Block Chain Technology
68. U18OEIT002-Semantic Web
69. U18OEIT003-Entrepreneurship Development
70. U18OEIT004-Ethical Hacking Techniques
71. U18OECS001-Mobile Application Development
72. U18OECS002-System Modelling and Simulation
73. U18OECS003-Web Programming
74. U18OECS004-Virtual Reality
75. U18OECS005- E Commerce
76. U18OEGE001-Metagenomics and Epigenomics
77. U18OEGE002-Molecular Genetics and Genomics
78. U18OEGE003-Principles of Molecular cell biology

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