

## **Bachelor of Science in Aeronautical Engineering**

### **Study Programmes**

The Department of Aerospace Engineering and Department of Avionics Engineering offers the degree of B. Sc. Engineering in Aeronautical Engineering (Aerospace and Avionics). The courses and syllabus followed by this department for the above degree is appropriate to the needs of recent developments in the world and the requirement of local industry. The syllabus is designed to contain all the necessary study materials so that a graduate can face engineering problems readily after graduation. The syllabus is subject to be reviewed and amendments every three years by a “committee of courses” comprising the best academicians and experts of the field of Aerospace and Avionics Engineering coming from BSMRAAU and other leading Universities and Organizations.

### **Educational Objectives**

The undergraduate aerospace engineering degree programme is designed to achieve the following objectives:

- a. Our graduates will be technically proficient and effective leaders and entrepreneurs. They will display high professional and ethical standards in aerospace engineering and related fields, and within industry, academia, and government.
- b. Our graduates will create new knowledge and engineering practices and develop products and services that have a global impact. They will collaborate with international partners and engage in culturally diverse teams.
- c. Our graduates will be life-long learners, continually developing their leadership, critical thinking, and problem-solving skills. They will be actively engaged in the acquisition and advancement of knowledge and technical expertise through research and development, and through active participation in professional societies, graduate studies, conferences, and symposia.
- d. Our graduates will transfer the knowledge gained from their aerospace engineering degrees to new fields that intersect with aerospace engineering such as robotics, medicine, and clean energy.

### **Vision of the Department**

To create skilled and competent professionals in the field of Aeronautical Engineering with high morals to meet the national and global needs through creative research and innovations.

### **Mission of the Programme**

Department of Aerospace and Avionics Engineering, BSMRAAU is working with the following missions in mind:

- a. To provide state-of-the-art education in Aerospace and Avionics Engineering, to produce qualified engineers, capable of solving real-world problems to meet the needs of industry and society.

- b. To contribute towards the creation of new knowledge through research and innovation in relevant fields of Aerospace and Avionics engineering and allied fields to address emerging national and global issues for well-being of the society.
- c. To enable students in attaining required ethics with an attitude of entrepreneurial skills, ethical values and social consciences.
- d. To embed leadership qualities amongst the students to follow successful professional career paths and to pursue advanced studies in Aerospace and Avionics engineering.

### **Detailed Course Plan of Aeronautical Engineering (Aerospace)**

The detailed course plan for Bachelor of Science in Aeronautical Engineering (Aerospace) is presented in this chapter. The programme includes 40 theory courses and 25 sessional courses covering 121 and 37 credit hours for theory and sessional respectively. Total credit hours for the programme is 157 in 8 semesters.

#### **Term Wise Distribution of Courses for Aerospace Major**

Undergraduate students of the Department of Aerospace Engineering (ASE) must undertake the following course schedule, the term-wise distribution of which is given below:

##### **Semester 1**

| <b>Course No</b> | <b>Course Name</b>   | <b>Credit Hour</b> |
|------------------|--|--------------------|
| ASE 4101         | Introduction to Aeronautical Engineering   | 3                  |
| MAT 4101         | Differential Calculus and Integral Calculus  | 3                  |
| PHY 4101         | Physics-I (Waves, Oscillation, Optics and Thermal Physics)                         | 3                  |
| CHM 4101         | Chemistry (Atomic Structure, Thermo-Chemistry, Chemistry of Engineering Materials) | 3                  |
| EEE 4191         | Electrical Circuit Analysis I  | 3                  |
| ASE 4102         | Aeronautical Engineering Drawing-I   | 1.5                |
| CHM 4102         | Chemistry Sessional  | 1.5                |
| EEE 4192         | Electrical Circuit Analysis I Sessional  | 1.5                |

##### **Semester 2**

| <b>Course No</b> | <b>Course Name</b>   | <b>Credit Hour</b> |
|------------------|--|--------------------|
| HUM 4201         | Communicative English  | 3                  |
| HUM 4203         | Bangladesh Studies and Sociology   | 3                  |
| MAT 4203         | Ordinary and Partial Differential Equations                              | 3                  |
| PHY 4203         | Physics II (Electricity, Magnetism, Modern Physics and Mechanics)        | 3                  |
| CSE 4291         | Computer Programming and Application                                     | 3                  |
| SHP 4202         | Workshop Technology Sessional  | 1.5                |
| HUM 4202         | Communicative English Sessional (Technical Report Writing and Sessional) | .75                |
| PHY 4204         | Physics Sessional  | 1.5                |

| Course No | Course Name                                    | Credit Hour |
|-----------|--|-------------|
| CSE 4292  | Computer Programming and Application Sessional | 1.5         |

### Semester 3

| Course No | Course Name                                     | Credit Hour |
|-----------|---|-------------|
| ASE 4321  | Mechanics of Materials                          | 3           |
| ASE 4341  | Thermodynamics                                  | 3           |
| ASE 4351  | Statics   | 3           |
| MAT 4305  | Linear Algebra and Coordinate Geometry          | 3           |
| EEE 4391  | Electrical and Electronics Technology           | 3           |
| ASE 4304  | Aeronautical Engineering Drawing II             | 1.5         |
| ASE 4322  | Mechanics of Materials Sessional                | 1.5         |
| ASE 4342  | Thermodynamics Sessional                        | .75         |
| EEE 4392  | Electrical and Electronics Technology Sessional | .75         |

### Semester 4

| Course No | Course Name                                      | Credit Hour |
|-----------|--|-------------|
| ASE 4405  | Numerical Methods in Engineering                 | 3           |
| ASE 4411  | Fundamentals of Fluid Mechanics                  | 3           |
| ASE 4453  | Dynamics   | 3           |
| ASE 4455  | Feedback Control System                          | 3           |
| MAT 4407  | Complex Variables, Fourier and Laplace Transform | 3           |
| ASE 4406  | Numerical Methods in Engineering Sessional       | 1.5         |
| ASE 4412  | Fundamentals of Fluid Mechanics Sessional        | .75         |
| ASE 4456  | Feedback Control System Sessional                | .75         |

### Semester 5

| Course No | Course Name                                    | Credit Hour |
|-----------|--|-------------|
| ASE 4513  | Aerodynamics                                   | 3           |
| ASE 4531  | Aerospace Structural System Analysis           | 3           |
| ASE 4543  | Heat Transfer                                  | 3           |
| ASE 4557  | Aerospace Vehicle Performance                  | 3           |
| ASE 4561  | Orbital Mechanics                              | 3           |
| ASE 4514  | Aerodynamics Sessional                         | 1.5         |
| ASE 4532  | Aerospace Structural System Analysis Sessional | 1.5         |
| ASE 4544  | Heat Transfer Sessional                        | 1.5         |

### Semester 6

| Course No | Course Name                             | Credit Hour |
|-----------|---|-------------|
| ASE 4623  | Aerospace Materials                     | 3           |
| ASE 4633  | Structural Vibration and Aeroelasticity | 3           |

|          |  |     |
|----------|--|-----|
| ASE 4645 | Aerosapce Propulsion                   | 4   |
| ASE 4659 | Aerosapce Vehicle Dynamics and Control | 3   |
| HUM 4611 | Engineering Ethics and Professionalism | 2   |
| ASE 4624 | Aerospace Materials Sessional          | .75 |
| ASE 4646 | Aerospace Propulsion Sessional         | 1.5 |
| ASE 4602 | Capstone Project / IDP                 | 1.5 |
| ASE 4600 | Industrial Training*                   | 1   |

### Semester 7

| Course No  | Course Name                                     | Credit Hour |
|------------|---|-------------|
| ASE 4771   | Aerospace Systems Engineering                   | 3           |
| ASE 4773   | Aircraft Design                                 | 3           |
| HUM 4713   | Engineering Economics                           | 3           |
| Optional I | Selected from prescribed optional subjects      | 3           |
| AVE 4791   | Avionics Systems                                | 3           |
| ASE 4774   | Aircraft / Launch Vehicle / Space System Design | 1.5         |
| ASE 4602   | Capstone Project / IDP                          | 3           |
| ASE 4700   | Thesis  | 1.5         |

### Semester 8

| Course No    | Course Name                                     | Credit Hour |
|--------------|---|-------------|
| ASE 4807     | Industrial and Business Management              | 3           |
| ASE 4815     | High Speed Aerodynamics                         | 3           |
| ASE 4875     | Space System / Launch Vehicle Design            | 3           |
| Optional II  | Selected from prescribed optional subjects      | 3           |
| Optional III | Selected from prescribed optional subjects      | 3           |
| ASE 4774     | Aircraft / Launch Vehicle / Space System Design | 1.5         |
| ASE 4700     | Thesis  | 3           |

### Optional Courses

#### List of Elective Courses from Aerospace Engineering Department

Undergraduate students from Aerospace engineering department is to choose courses from the following list of Aerospace engineering courses.

| Course No | Course Name  | Credit Hour |
|-----------|--|-------------|
| ASE 4715  | Computational Fluid Dynamics                       | 3           |
| ASE 4717  | Hypersonic Aerodynamics                            | 3           |
| ASE 4725  | Advanced Aerosapce Materials Processing Technology | 3           |
| ASE 4749  | Rockets and Missiles                               | 3           |
| ASE 4763  | Spacecraft Attitude Determination and Control      | 3           |
| ASE 4765  | Guidance, Navigation and Control                   | 3           |
| ASE 4767  | Rotorcraft Performance                             | 3           |

| <b>Course No</b> | <b>Course Name</b>                            | <b>Credit Hour</b> |
|------------------|---|--------------------|
| ASE 4785         | Maintenance Management and Repair of Aircraft | 3                  |
| ASE 4787         | Aircraft Pressurization System                | 3                  |
| ASE 4789         | Aircraft Structural Design                    | 3                  |

### **List of Elective Courses from Mechanical Engineering Department**

Optional courses from the department of Mechanical engineering are as follows:

| <b>Course No</b> | <b>Course Name</b>                           | <b>Credit Hour</b> |
|------------------|--|--------------------|
| MCE 4743         | Advanced Programming with MATLAB             | 3                  |
| MCE 4761         | Finite Element Analysis of Solids and Fluids | 3                  |
| MCE 4763         | Fundamentals of Nano Engineering             | 3                  |
| MCE 4765         | Introduction to Robotics                     | 3                  |
| MCE 4767         | Mechatronics                                 | 3                  |
| MCE 4769         | Product Design                               | 3                  |
| MCE 4771         | Renewable Energy                             | 3                  |
| MCE 4773         | Combustion and Pollution                     | 3                  |
| MCE 4775         | Energy and Environment                       | 3                  |

## Detailed Course Plan of Aeronautical Engineering (Avionics)

The detailed course plan for Bachelor of Science in Aeronautical Engineering (Avionics) is presented in this chapter. The programme includes 41 theory courses and 29 sessional courses covering 117.50 and 42.25 credit hours for theory and sessional respectively. Total credit hours for the programme is 159.75 in 8 semesters.

### Term Wise Distribution of Courses for Avionics Degree

Undergraduate students of the Department of Avionics Engineering (AVE) must undertake the following course schedule, the term-wise distribution of which is given below:

#### Semester 1

| Course No | Course Name   | Credit Hour |
|-----------|---|-------------|
| PHY 4101  | Physics (Waves and Oscillation, Optics and Thermal Physics) | 3           |
| AVE 4101  | Electrical Circuits-I                                       | 3           |
| MAT 4101  | Differential and Integral Calculus                          | 3           |
| ASE 4101  | Introduction to Aeronautical Engineering                    | 3           |
| HUM 4103  | Bangladesh Studies and Sociology                            | 3           |
| PHY 4102  | Physics Sessional   | 1.5         |
| AVE 4102  | Electrical Circuits-I Sessional                             | 1.5         |
| SHP 4102  | Workshop Technology Sessional –I                            | .75         |
| ASE 4102  | Aeronautical Engineering Drawing-1                          | 1.5         |

#### Semester 2

| Course No | Course Name                                 | Credit Hour |
|-----------|---|-------------|
| AVE 4201  | Electrical Circuits II                      | 3           |
| CHM 4201  | Chemistry                                   | 3           |
| MAT 4201  | Ordinary and Partial Differential Equations | 3           |
| ASE 4251  | Statics                                     | 3           |
| HUM 4201  | Communicative English                       | 3           |
| AVE 4202  | Electrical Circuits II                      | 1.5         |
| CHM 4202  | Chemistry Sessional                         | 1.5         |
| HUM 4202  | Communicative English Sessional             | 1.5         |
| SHP 4202  | Workshop Technology Sessional –II           | .75         |

#### Semester 3

| Course No | Course Name                            | Credit Hour |
|-----------|--|-------------|
| AVE 4301  | Electronic Circuits I                  | 3           |
| ASE 4301  | Thermodynamics                         | 3           |
| AVE 4303  | Computer Programming                   | 3           |
| ASE 4353  | Dynamics                               | 3           |
| MAT 4301  | Linear Algebra and Coordinate Geometry | 3           |
| AVE 4302  | Electronic Circuits I Sessional        | 1.5         |
| AVE 4304  | Computer Programming Sessional         | 1.5         |
| ASE 4302  | Thermodynamics Sessional               | .75         |

**Semester 4**

| Course No | Course Name   | Credit Hour |
|-----------|---|-------------|
| AVE 4401  | Electronic Circuits II                                  | 3           |
| AVE 4403  | Electromechanical Systems                               | 3           |
| AVE 4405  | Introduction to Data Structures and Algorithm           | 3           |
| MAT 4401  | Complex Variables, Fourier and Laplace Transform        | 3           |
| AVE 4407  | Numerical Analysis                                      | 3           |
| AVE 4402  | Electronic Circuits II Sessional                        | 1.5         |
| AVE 4404  | Electromechanical Systems Sessional                     | 1.5         |
| AVE 4408  | Numerical Analysis Sessional                            | .75         |
| AVE 4406  | Introduction to Data Structures and Algorithm Sessional | .75         |

**Semester 5**

| Course No | Course Name                                | Credit Hour |
|-----------|--|-------------|
| AVE 4501  | Digital Systems and Logic Design           | 3           |
| AVE 4503  | Electromagnetic Field Theory               | 3           |
| ASE 4501  | Aerodynamics                               | 3           |
| AVE 4505  | Signals and Systems                        | 3           |
| MAT 4501  | Probability and Statistics                 | 3           |
| AVE 4502  | Digital Systems and Logic Design Sessional | 1.5         |
| ASE 4502  | Aerodynamic Sessional                      | .75         |
| ASE 4508  | Aeronautical Engineering Drawing-II        | 1.5         |
| AVE 4510  | Technical Report Writing and Presentation  | .75         |

**Semester 6**

| Course No | Course Name                                  | Credit Hour |
|-----------|--|-------------|
| AVE 4601  | Analogue and Digital Communications          | 3           |
| AVE 4603  | Microcomputers and Embedded Systems          | 3           |
| AVE 4605  | Microwave Engineering                        | 3           |
| ASE 4659  | Aerospace Vehicle Stability and Control      | 3           |
| HUM 4615  | Industrial Management                        | 3           |
| AVE 4602  | Analogue and Digital Communication Sessional | 1.5         |
| AVE 4604  | Microcomputer and Embedded Systems Sessional | 1.5         |
| AVE 4600  | Capstone Project                             | 1.5         |
| AVE 4698  | Industrial Training                          | 1.0         |

## Semester 7

| Course No | Course Name  | Credit Hour |
|-----------|--|-------------|
| AVE 4701  | Real Time Embedded Systems                         | 3           |
| AVE 4703  | Digital Signal Processing                          | 3           |
| AVE 4705  | Modern Control Systems                             | 3           |
| AVE 4707  | Aircraft Electrical Systems and Autopilot          | 3           |
| HUM 4713  | Engineering Economics                              | 3           |
| AVE 4704  | Digital Signal Processing Sessional                | .75         |
| AVE 4708  | Aircraft Electrical System and Autopilot Sessional | 1.5         |
| AVE 4600  | Capstone Project                                   | 3           |
| AVE 4700  | Thesis   | 1.5         |

## Semester 8

| Course No   | Course Name   | Credit Hour |
|-------------|---|-------------|
| AVE 4801    | Radar Engineering                                       | 3           |
| AVE 4803    | Aircraft Instrument and Measurement                     | 3           |
| AVE 4805    | Aircraft Navigation and Communication Systems           | 3           |
| HUM 4817    | Engineering Ethics and Professionalism                  | 1.5         |
| Optional I  | Optional Course # 1                                     | 2           |
| Optional II | Optional Course # 2                                     | 2           |
| AVE 4802    | Radar Engineering Sessional                             | .75         |
| AVE 4806    | Aircraft Navigation and Communication Systems Sessional | 1.5         |
| AVE 4804    | Aircraft Instruments and Measurement Sessional          | 1.5         |
| AVE 4800    | Thesis  | 3           |

## Elective Courses

Students of B.Sc. in Aeronautical Engineering (Avionics) can choose 2 elective courses covering 4 credit hours. Students can take optional courses from any of the following courses offered. Availability of elective courses is subject to availability of faculty and related laboratory facilities.

### List of Elective Courses from Avionics Engineering Department

Undergraduate students from Avionics engineering department is to choose courses from the following list of Avionics engineering courses.

| Course Code | Course Name                    | Credit Hour |
|-------------|--------------------------------|-------------|
| AVE 4807    | Microwave Devices and Circuits | 2           |
| AVE 4809    | Satellite Communication        | 2           |
| AVE 4811    | Optoelectronics                | 2           |
| AVE 4813    | Electronic Warfare             | 2           |
| AVE 4815    | Optical Fibre Communication    | 2           |
| AVE 4817    | Computer Networks              | 2           |



|          |                                   |   |
|----------|-----------------------------------|---|
| AVE 4821 | Transmission Lines and Waveguides | 2 |
| AVE 4823 | Antenna Theory                    | 2 |

### **List of Elective Courses from Aerospace Engineering Department**

Undergraduate students from Avionics engineering department is to choose courses from the following list of Aerospace engineering courses.

| <b>Course Code</b> | <b>Course Name</b>                            | <b>Credit Hour</b> |
|--------------------|---|--------------------|
| ASE 4885           | Maintenance Management and Repair of Aircraft | 2                  |
| ASE 4861           | Orbital Mechanics                             | 2                  |