

**CURRICULA**  
**OF**  
**AEROSPACE ENGINEERING**

**B.E/B.Sc**  
**M.E/M.Sc**

(Revised 2008)



**HIGHER EDUCATION COMMISSION**  
**ISLAMABAD**

## **CURRICULUM DIVISION, HEC**

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# PREFACE

Curriculum development is a highly organized and systematic process and involves a number of procedures. Many of these procedures include incorporating the results from international research studies and reforms made in other countries. These studies and reforms are then related to the particular subject and the position in Pakistan so that the proposed curriculum may have its roots in the socio-economics setup in which it is to be introduced. Hence, unlike a machine, it is not possible to accept any curriculum in its entirety. It has to be studied thoroughly and all aspects are to be critically examined before any component is recommended for adoption.

In exercise of the powers conferred by sub-section (1) of section 3 of the Federal Supervision of Curricula Textbooks and Maintenance of Standards of Education Act 1976, the Federal Government vide notification No. D773/76-JEA (cur.), dated December 4<sup>th</sup> 1976, appointed the University Grants Commission as the competent authority to look after the curriculum revision work beyond class XII at the bachelor level and onwards to all degrees, certificates and diplomas awarded by degree colleges, universities and other institutions of higher education.

In pursuance of the above decisions and directives, the Higher Education Commission (HEC) is continually performing curriculum revision in collaboration with universities. According to the decision of the special meeting of Vice-Chancellor's Committee, the curriculum of a subject must be reviewed after every 3 years.

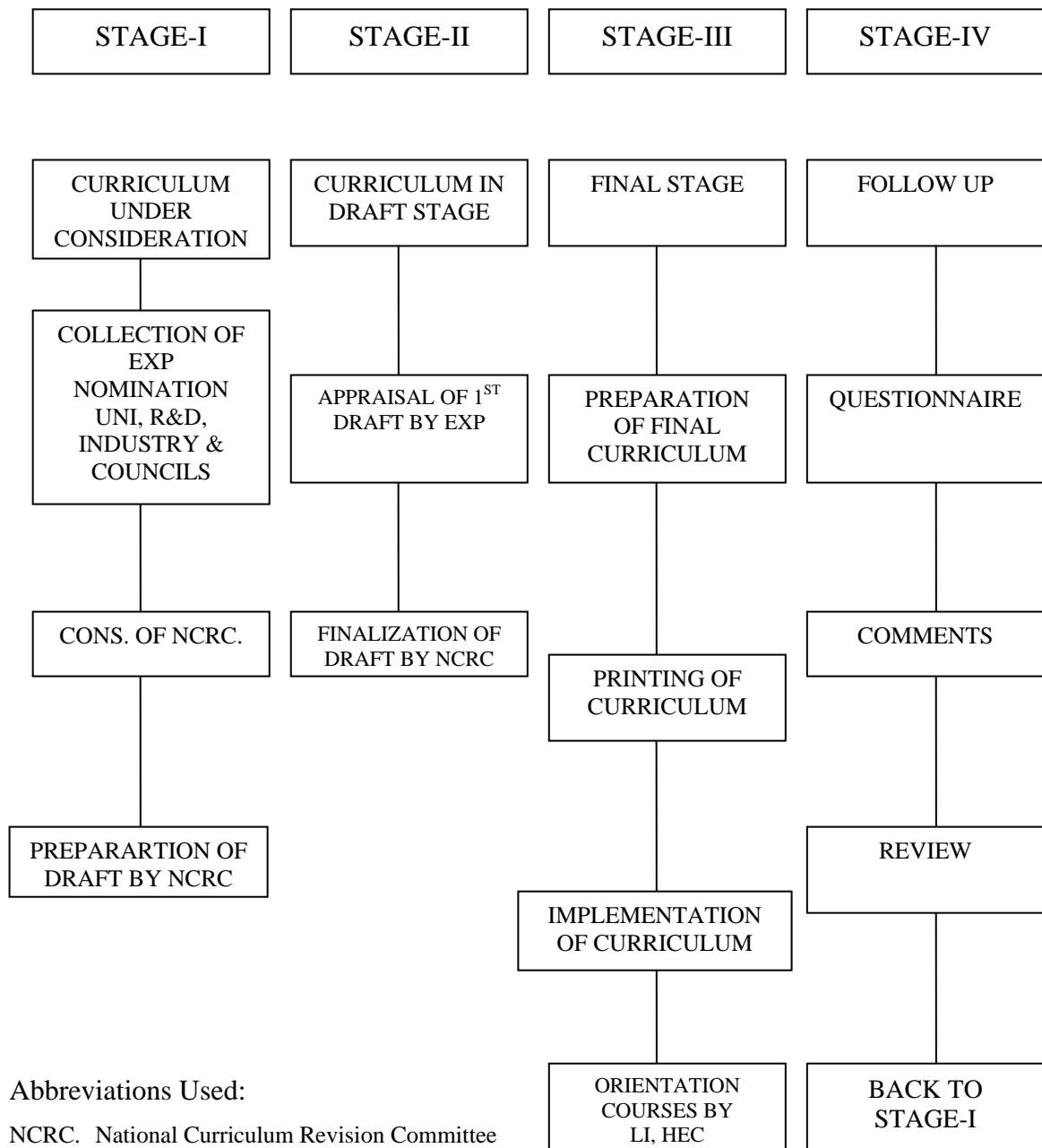
A committee of experts comprising of conveners from the National Curriculum Revision of HEC in Basic, Applied Social Sciences and Engineering disciplines met in April 2007 and developed a unified template to standardize degree programs in the country to bring the national curriculum at par with international standards, and to fulfill the needs of the local industries. It also aimed to give a basic, broad based knowledge to the students to ensure the quality of education. The new BS degree shall be of 4 years duration, and will require the completion of 130-136 credit hours. The engineering degree will devote 65-70% of the curriculum towards engineering courses, and 35--30% to non Engineering courses.

For the purpose of curriculum revision various committees are constituted at the national level, comprising of senior teachers nominated by universities, degree awarding institutions, R&D organizations and respective accreditation councils. The National Curriculum Revision Committee for Aerospace Engineering in a meeting held on May 13-14, 2008 at the HEC Head Office Islamabad revised the curriculum in light of the unified template. The final draft prepared by the National Curriculum Revision Special Committee, duly approved by the competent authority, is being circulated for implementation in the concerned institutions.

**DR. RIAZ-UL-HAQ TARIQ**  
**Member Academics**

**August 2008**

# CURRICULUM DEVELOPMENT



**Abbreviations Used:**

- NCRC. National Curriculum Revision Committee
- VCC. Vice-Chancellor's Committee
- EXP. Experts
- COL. Colleges
- UNI. Universities
- PREP. Preparation
- REC. Recommendations
- LI Learning Innovation
- R&D Research & Development Organization
- HEC Higher Education Commission

## INTRODUCTION

A *National Curriculum Revision Committee meeting in Aerospace Engineering* (NCRC-Aerospace Engg) was held on May 13-14, 2008 at HEC Head Office, Islamabad to finalize the draft curricula for Aerospace Engineering in the light of generic framework for engineering discipline.

### Participants of the Meeting

1. Dr. Khalid Parvez Convener  
Professor & Dean  
College of Aeronautical Engineering,  
PAF Academy, Risalpur  
National University of Sciences & Technology,  
(NUST), Rawalpindi.
2. Dr. Khalid M. Tahir, Sitara-i-Imtiaz (M) Member  
Director General,  
Institute of Avionics & Aeronautics (IAA),  
Air University,  
Sector E-9, Islamabad.
3. Engr. Aleem Arshad Member  
Director,  
National Development Complex, National  
Engineering & Scientific Plot 94, Sector H-11/4,  
Islamabad
4. Engr. Dr. Sarwar Naqvi Member  
Professor & Head  
Department of Aeronautics & Astronautics  
Institute of Space Technology, Islamabad
5. Engr. Gp Capt Sher Afgan, S.I(M) (Retd) Member  
Assistant Professor  
Institute of Space Technology,  
Islamabad
6. Prof. Dr. Salim ur Rahman, Member  
Vice Chancellor,  
Sarhad University of Science & Information  
Technology, 36 -B Chinar Road,  
University Town, Peshawar
7. Engr. Ayaz Aziz, Member  
Director General,  
Institute of Space Technology,  
Islamabad

- |    |  |           |
|----|--|-----------|
| 8. | Dr. Jahanzeb Masood,<br>Institute of Avionics & Aeronautics (IAA),<br>Air University,<br>Sector E-9, Islamabad.  | Member    |
| 9. | Engr Muhammad Mansha<br>General Manager Technical,<br>National Development Complex, National<br>Engineering & Scientific Plot 94, Sector H11/4,<br>Islamabad | Member    |
| 10 | Dr. Zahid Iqbal Baig,<br>PAF Officers Mess,<br>Shahrah-e-Faisal,<br>Karachi  | Secretary |

Meeting started with the recitation of Holy Quran by Muhammad Tahir Ali Shah, Assistant Director (Curriculum). He briefed the participants about the objective and agenda of the meeting. Ms. Ghayyur Fatima, Deputy Director (Curriculum) welcomed the participants on the behalf of Chairman, Higher Education Commission.. She expressed pleasure over the participation of academia from around the country, representing both the public sector universities, degree awarding institutions and R&D Organization.

The participants agreed to retain Prof. Dr. Khalid Parvez as the Convener and appoint Dr. Zahid Iqbal Baig, as the Secretary of the NCRC-Aerospace Engineering.

Professor Dr. Khalid Parvez, Convener of the Committee, welcomed the participants and thanked HEC for their efforts and the following universities/organizations for sending their representatives to participate in the important national cause.

1. PAF College of Aeronautical Engineering, NUST, PAF Academy, Risalpur
2. Institute of Space Technology, Islamabad
3. NDC-NESCOM, Islamabad
4. PAF Karachi
5. Sarhad University of Science & Information Technology, Peshawar.

The Convener explained the observation/comments on draft curriculum by experts to the participants, and invited their comments / suggestions.

## Item No.1 Vision of Aerospace Engineering Education

Prof. Dr. Khalid Parvez proposed to develop a clear vision of Aeronautical engineering to inspire and guide the task of curriculum development and define the scope of Aerospace Engineering. He stated that this discipline involve the application of Engineering concepts, techniques, and methods to the development of airborne systems. An Aerospace engineering programme should develop professionals who have a mastery of the respective system development principles, theory, practice, and process.

Prof. Dr. Khalid Parvez said that Aerospace Engineering, like other engineering disciplines, must lay an emphasis on issues of process, design, measurement, analysis and verification providing a strong foundation in engineering principles and practices as applied to the aerospace system development.

The Committee held detailed and extensive deliberation on the curricula. It was noted that the rapidly emerging and developing areas of Aerospace engineering offer challenges and newer and exciting opportunities. The Committee agreed that the proposed curricula should be geared towards exploring the subject at theoretical, practical, and application levels. It must address the need to establish concepts, knowledge and practical experience in all aspects of Aerospace cycle — requirements, problem analysis, design, construction, testing, maintenance and project planning and control. The curriculum, it was felt, should also take into account the human aspect of the discipline in terms of human-machine interaction.

The Committee came up with the following Vision Statement for Aeronautical education in Pakistan:

**“The Aeronautical education in Pakistan will focus on imparting to students the knowledge and training which should enable them to harmonize theory with practice, concept with application, and problem with solution. It will prepare them to amicably apply engineering principles, processes and practices to aerospace systems, and their maintenance. The programme will also, in addition to students’ professional growth, attend to development of their personal and interpersonal skills. It will help students to enhance their ability in oral and written communication, and their adaptability to group-work environments. These programmes will inculcate among students a strong sense of civic, professional and ethical responsibility. These programs will strive to develop in the professionals a capacity for innovation and a passion for life long learning.”**

The meeting expressed confidence that the curricula thus developed will reflect the spirit as contained in the Vision Statement and when implemented, these will satisfy the professional demands of industry and academia. The graduates thus produced will be adequately equipped

to exploit the opportunities and answer the challenges offered by the modern world.

## **Item No.2            Knowledge Areas of Aerospace Curriculum Development**

The Chair formed a committee for Aerospace Engineering and expressed the need to approach curriculum development systematically by identifying the major knowledge areas of Aerospace Engineering education at the outset.

The following major areas are considered appropriate to design the curricula of Aerospace Engineering:

### **Aerospace Engineering**

1.    **Non-Engineering**
  - a. Humanities (English, Culture, Social Sciences)
  - b. Management Sciences
  - c. Natural Sciences (Mathematics, Physics, Chemistry)
  
2.    **Engineering**
  - a. Computing (Fundamentals, Programming, Design)
  - b. Engineering Foundation
  - c. Major Based Core Depth and Breadth (Space Sciences, Aerodynamics, Thermodynamics, Structures, Mechanics)
  - d. Inter-disciplinary electives

The Committee discussed various international recommendations and standards presented to the participants. The meeting recognized that good curricula should focus on building a solid foundation in the early stages of learning and gradually introducing and strengthening the core professional competencies and desired skill-sets. The main technical Aerospace content should be covered during the second, third and fourth years. Laboratory component should inculcate among students an industrious approach and practice towards problem solving. Good engineering practices must be nurtured all along the education programme. As the practice of Aerospace Engineering is often in the context of multi-application domains, therefore, the graduates should be provided an opportunity of reasonably broad exposure to learn and demonstrate the application of engineering practices. A final year design project should provide the opportunity to bring together all the knowledge gained in a wide variety of courses to solve realistic problems.

## **Item No.3            Duration of Programmes**

The BE Aerospace Engineering Degree programme would be minimum 4-year programmes spread over 8 semesters and M.S Aerospace Engineering programme would be minimum 1-1/2-year programme spread over 4 semesters.

#### **Item No.4 Eligibility and Admission Criteria**

The eligibility criteria for B.E/B.S Aerospace Engineering were discussed. It was proposed that candidates should have an intermediate with physics, mathematics and chemistry or equivalent qualifications with at least 50% marks (requirement of PEC); however, universities may define their own admission criteria.

The eligibility criterion for admission to M.E/M.S Aerospace Engineering was unanimously agreed to be B.E/B.S Engineering in the relevant field. Admission criterion is to be decided by the institutes themselves in the light of guidelines provided by the HEC.

#### **Item No.5 BE/BS Programme Structure**

All participants agreed that the proposed programmes in Aerospace Engineering meet the needs of learning outcomes in terms of knowledge outcomes and ability outcomes with relevant skills. The development of curricula is expected to enhance the theoretical and practical understanding of the field of Aerospace Engineering.

Minimum credit hours earned by a student shall be 130 for the award of B.E/B.S degrees in Aerospace. Overall distribution must conform to the criteria laid down by HEC and PEC.

It was unanimously agreed that in addition to the curricula for B.E/B.S in Aerospace Engineering developed in conformity with the criteria laid down above, qualified and dedicated faculty along with standard laboratory facilities to support theoretical classroom instruction was the hallmark of quality education. HEC and PEC being two national bodies dealing with engineering education in the country must ensure availability of qualified and dedicated faculty along with standard laboratory facilities at universities/institutes offering B.E/B.S Aerospace Engineering programme.

#### **Item No. 6 Constitution of Committee**

A committee was constituted on the proposal of participants to work in detail on various important issues of the agenda. Subsequently the following committee was constituted:-

##### **Sub-committee for Aerospace Engineering**

1. Engr. Gp Capt Sher Afgan, S.I(M) (Retd) Coordinator
2. Engr Prof Dr. Sarwar Naqvi
3. Dr. Zahid Baig
4. Engr. Wing Cdr. Dr. Jahanzeb Masood
5. Engr. Muhammad Mansha

## **Item No. 7 M.S Aerospace Engineering — Programme Structure**

The M.S Aerospace Engineering programmes were also discussed and agreed upon in the meeting. It was noted that the MS Aerospace programmes should be designed as a next higher degree in the profession for BE Aerospace graduates.

For MS minimum credit hours earned by a student shall be 30. Following is the distribution of total credit hours.

<b>Component</b>	<b>Credit Hours</b>
Courses	15
Electives	09
Thesis	06
<b>Total</b>	<b>30</b>

## **Item No. 8 Objectives of MS Aerospace Engineering**

The objectives of MS Aerospace Engineering programmes should be to produce graduates, who:

1. Are well-educated, highly valued and successful professionals, technically well prepared for their subsequent assignments, duties and responsibilities as Aerospace engineers in public as well as private sector organizations. (Such positions may range from requiring very detailed and advanced work in a specific discipline to broad responsibilities requiring interaction among many disciplines and technical organizations – interdisciplinary teamwork.)
2. Have been provided core education in Aerospace Engineering.
3. Possess detailed understanding in one or two speciality areas.
4. Apply foundational scientific concepts and sound engineering principles to efficiently and effectively advance technological capabilities in the country.
5. Have experience in conducting and documenting an independent investigation of a problem pertaining to Aerospace Engineering.
6. Professionally communicate technical solutions and results.
7. Continue to pursue lifelong multidisciplinary learning as professional engineers.

The curricula for M.S Aerospace being followed presently at Air University and Institute of Space Technology offering MS level programmes were discussed and were found meeting the vision and the programme objectives agreed upon by the committee. The committee agreed to enhance the scope of the M.S curricula to include majors like “Flight Dynamics & Control” and “ Aerospace vehicle Design &

Optimization” in addition to the earlier three majors so that the MS Aerospace majors are consistent with international trends.

Contents and descriptions of courses to facilitate accomplishment of the programme objectives were deliberated in light of the M.S Aerospace programmes of IAA and IST it is agreed that course contents being followed are comprehensive and should be recommended for the M.S Aerospace programmes in Fluid dynamics / Aerodynamics major and Solid Mechanics/Structures major.

## **Item No. 9            Conclusion**

Finally, Mr. Tahir Ali Shah, Assistant Director (Curriculum, HEC, Islamabad thanked all the participants for their valuable contribution to this national cause. Dr. Khalid Parvez, the Convener also thanked the participants for their willing and useful participation. He said that their efforts will go a long way in developing workable, useful and comprehensive degree programmes in Aerospace Engineering. He said this entire exercise has not only been utilized by the HEC for developing Aerospace Engineering degree programme but it also provided an opportunity to professionals and faculty from all around the country to interact for mutual benefit in professional development. He also expressed his profound gratitude to the HEC for providing an excellent opportunity to academicians of public and private sector universities from all over the country to contribute their time, knowledge, expertise, and experience to this important national cause.

The meeting concluded with vote of thanks to the Chair.

## FRAME WORK FOR BE/B.Sc. AEROSPACE ENGINEERING

<b>Non-Engineering Domain</b>									
<b>Knowledge Area</b>	<b>Sub Area</b>	<b>Name of Course</b>	<b>Lec Ch</b>	<b>Leb Ch</b>	<b>Credit Hrs</b>	<b>Total Courses</b>	<b>Total Credits</b>	<b>% Area</b>	<b>% Overall</b>
Humanities	English	English-I Functional English	3	0	3	4	9-11	20.5-23.4	6.9-8.1
		English-II Communication Skills	3	0	3				
		English-III Technical Report Writing & Presentation Skills	3	0	3				
		English-IV (Optional)	2	0	0				
	Culture	Islamic Studies	2	0	2	2	4	9.1-8.5	3.1-2.9
		Pakistan Studies	2	0	2				
	Social Sciences	Social Sciences-I	3	0	3	2	6	13.6- 2.8	4.6-4.4
		Social Sciences-II	3	0	3				
Management Sciences	--	Professional Practice	3	0	3	2	6	13.6-12.8	4.6-4.4
		Engineering Management	3	0	3				
Natural Sciences	Math	Math-I (Element of applied Algebra and Calculus-I)	3	0	3	3	9	20.5- 9.1	6.9- 6.6
		Math-II (Calculus-II and Differential Equation)	3	0	3				
		Math-III (Advance Engg Mathematics)	3	0	3				
	Physics	Engg Physics	3	1	4	1	4	9.1-8.5	3.1-2.9
		Elective-I	3	0	3	2	6	13.6-14.9	4.6-5.1
		Elective-II	3	0	3				
<b>Total</b>						<b>16</b>	<b>44-46</b>	<b>100</b>	<b>33.8-34.6</b>

Engineering Domain									
Knowledge Area	Sub Area	Name of Course	Lec Ch	Leb Ch	Cr. H	Total Courses	Total Credits	% Area	% Overall
Computing	Fundamentals	Introduction to computing	2	1	3	3	9	10.46	6.92-6.81
	Programming	Computer Programming	2	1	3				
	Design	Computer Applications in Engineering Design (Engg Drawing)	2	1	3				
Engineering Foundation	--	Introduction to Aerospace Engineering	3	0	3	8	26	30.23	20-19.69
		Engg Mechanics I (Statics)	3	0	3				
		Thermodynamic	3	1	4				
		Mechanics of Materials	3	0	3				
		Materials Science	3	0	3				
		Incompressible Aerodynamics	3	1	4				
		Engineering Mechanics II (Dynamics)	3	0	3				
		Probability Methods in Engineering	3	0	3				
Major Based Core (Breadth)		Compressible Aerodynamics	3	1	4	6	20	23.25	15.38-15.15
		*Thermal Sciences	3	0	3				
		Aerovehicle Performance	3	0	3				
		Stability and Control	3	0	3				
		Aerospace Structures I Aerospace Instrumentation	3 3	1 0	4 3				
Major based Core (Depth)		Aerospace Structures II	3	0	3	6	18	20.93	13.84-13.63
		Aerospace Vehicle Design	3	0	3				
		Structural Dynamics & Aeroelasticity	3	0	3				
		Aerothermodynamics (Propulsion)	3	0	3				
		Control Systems	3	0	3				
		** Elective-I	3	0	3				
Inter-Disciplinary Engineering Breadth (Electives)		IDEE-1	3	0	3	2	7	8.13	5.38-5.30
		IDEE-1I	3	1	4				
Senior Design Project		Project	0	6	6	0	6	6.97	4.61-4.54
Total			68			26	86	100	66.2-65.4

\* Space propulsion / Thermodynamics-II

\*\* Space Flight Dynamics/Applied Computational Methods/Heat Transfers

# SCHEME OF STUDIES

## BE/BSc in Aerospace Engineering

### Semester 1

Math I	3-0
English I (Functional English)	3-0
Intro to Computing	2-1
Intro to Aerospace Engineering	3-0
Physics	3-1
Religious Studies	2-0
	16-2

### Semester 2

Math II	3-0
English II (Communication Skill)	3-0
Programming Language	2-1
IDEE I	3-1
Computer Applications (CAD)	2-1
Pakistan Studies	2-0
	15-3

### Semester 3

NS Elective I	3-0
Engineering Mechanics I	3-0
Incompressible Aerodynamics	3-1
Aerospace Materials	3-0
Thermodynamics	3-0
	15-1

### Semester 4

Math III	3-0
Engineering Mechanics II	3-0
Compressible Aerodynamics	3-1
Mechanics of Materials	3-0
Aerospace Instrumentation	3-0
	15-1

### Semester 5

Probability for Engineers	3-0
Aerospace Structures I	3-0
Flight Control Systems	3-1
Aerothermodynamics	3-0
Aero Vehicle Performance	3-0
	15-1

### Semester 6

NS Elective II	3-0
Aerospace Structures II	3-1
Stability & Control	3-0
English III (Technical Report Writing & Presentation Skills)	3-0
Engineering Management	3-0
	15-1

### Semester 7

Senior Design Project I	0-3
Thermal Sciences**	3-0
Aero Vehicle Design	1-2
Major Based Elective***	3-0
Social Science I	3-0
	10-5

### Semester 8

Senior Design Project II	0-3
Structural Dynamics	3-0
IDEE II	3-0
Professional Practice	3-0
Social Science II	3-0
	12-3

## Total 130

\* Universities may make their own semester wise programme.

\*\* Thermal Sciences: Space Propulsion/ Thermodynamics II

\*\*\* Major Based Elective: Space Flight Dynamics/ Heat Transfer

## Grand total = 130

## **DETAIL OF COURSES FOR B.E/B.S AEROSPACE ENGINEERING**

**Title of the Course: Math-I**

**Credit Hours: 3-0**

**Prerequisites: Intermediate Mathematics**



### **Specific Objectives of course:**

To provide student with a base for understanding complex engineering ideas.

### **Course Outline:**

Complex numbers and De Moivre's theorem determinants, matrices, product, inversion, rank, system of equations and Cramer's rule, synthetic division, remainder and factor theorem, roots of polynomial equations, graphical method and transcendental equations. Limit, continuity and differentiation involving algebraic, trigonometric, hyperbolic, implicit and composite functions; application to rates and small corrections, simple Cartesian, parametric and polar curves; tangent, normal, maxima and minima, Taylor and Maclaurin series; curvature. Integration as inverse of differentiation, by substitution, by parts and partial fraction; definite integrals (Wallis formula); integral as limit for a sum, area and arc length of plane figures, volumes and surfaces of solids of revolution.

### **Recommended Books:**

-  *Integrated Algebra and Trigonometry by Fisher and Zeibur, Prentice Hall, New Jersey, 1972*
-  *Calculus and Analytic Geometry by Thomas, 9<sup>th</sup> Ed, Addison Wesley, England, 1996*

**Title of the Course: Engineering Physics**


**Credit Hours: 3-1**

**Prerequisites: Nil**

### **Course Outline:**

The course includes dimensional analysis, experimental errors; force and torque, general conditions of equilibrium work, energy and power angular motion and moment of inertia. Electric field intensity, current and resistance; kirchhoff's laws for electrical circuits, electromagnetism, thermoelectricity are also covered in this course. Simple Harmonic Motion (SHM), composition of SHM, Damped SHM, Lissajous figures, beats, doppler effect, loudness and intensity and fundamental concepts in geometrical optics, wave theories of light, dual nature of radiation and matter, interference, diffraction, polarization, double refraction and its application to optical stress analysis also form part of this course.

**Recommended Books:**

 *University Physics by Sears & Zemansky, 4<sup>th</sup> Ed, Addison Wesley, London, 1973*

**English – I (Functional English)****Annex – A****Islamic Studies****Annex - B****Title of the Course: Introduction to Aerospace Engineering****Credit Hours: 3-0****Prerequisites: Nil****Course Outline:**

This is an introductory course of Aerospace Engineering aimed at giving practical understanding of aircraft and its systems to the engineering students. It encompasses the aspects of flight controls, aircraft construction, principles of jet reaction, flight instruments, and electrical systems. Also low-speed and high-speed subsonic wind tunnels and their instrumentations are introduced. The course also gives the concepts of aeronautics and astronautics.

Flight control studies deal with aerodynamics and aircraft control surfaces. Aircraft construction includes basic structure of aircraft, landing gears, hydraulic, pneumatic and fuel systems and also the maintenance inspections. The topic 'principle of jet reaction' includes thrust and power, factors effecting thrust, compressors and jet propulsion devices. The study of aircraft instruments includes flight, engine auxiliary instruments. The electrical system deals with power supply, power generation and electrical components. Armament systems study deals with aircraft ejection systems, fundamentals of bombs and firearms, principal and construction of ammunition and explosives. In addition to the text, a few videos and visits of aircraft maintenance facilities are included to help understanding course contents.

**Title of the course: Introduction to Computing****Credit Hours 2-1****Prerequisites: Basic Math****Specific Objective of the course:**

To introduce computer's Hardware and their functions to the students.

**Course Outline**

This course deals with major components of a computer. It also includes computer architecture its security matters, an overview of low-level programming, hardware specification, memory architecture and interface, direct memory access.

**Title of the Course: Mechanics of Materials****Credit Hours: 3-0****Prerequisites: Nil****Specific Objectives of course:**

The students should be able to understand stress-strain relation & behaviour of structures under different types of loading.

**Course Outline:**

The course covers the fundamental concepts required in air vehicle structure courses. Different loading conditions are analyzed and their effects on resisting members are studied. The course has been divided into two parts; in the first part analysis of stress-strain concept and their inter-relationship is covered whereas the second part includes the behaviour under different loading.

**Recommended Books:**

 *Mechanics of Materials by Archie Higdson, 4<sup>th</sup> Edition, John Wiley, NY*

**Engg Drawing CAD****Pre-requisite Knowledge of computer usage****Course Outlines:**

This course is specifically designed to introduce the student to the areas of manual drawing and computer aided drafting. The students are given an introduction to engineering drawing, concepts of lines, orthographic projects and how points and lines are projected. Introduction to CAD, drawing 2 D figures, isometric views and 3D solids and how these can be used in CNC machining.

**Books Recommended**

1. Class handouts
2. Elementary Engineering Drawing by N.D. Bhatt
3. Mastering Auto CAD 2000 by George Omura
4. Engineering Drawing and Drafting by T.E. French, C.J. Vierck, and R.J. Foster.

**Pakistan Studies****Annex-C**

## **MATH-III**

**Title of the Course: Advanced Engineering Mathematics**


**Credit Hours: 3-0**

**Prerequisites: Nil**

### **Course Outline:**

Laplace Transformation: Functions, derivatives, integral and basic theorems, inversion by partial fraction and convolution, linear differential equations with constant coefficients, system of equations, unit step and periodic functions. Introduction to partial differential equations, separation of variables, operator methods, wave, heat and Laplace equations with application to boundary value problems. Review of vector algebra; scalar and vector fields, Del-operator, gradient, divergence, curl and Laplacian in Cartesian and orthogonal curvilinear coordinates Gauss and Stokes theorems. Complex Variables: Analytic functions, Cauchy-Riemann equations and harmonic functions; complex integration, Cauchy integral theorem, integral formula, Taylor and Maclaurin series; poles, residues, residue theorem, application to contour and improper integrals.

### **Recommended Books:**

 *Advanced Engineering Mathematics by Kreyszig, 8<sup>th</sup> Ed, John Wiley, Singapore, 1999*

## **Title of the Course: THERMODYNAMICS-I**

**Credit Hours: 3-0**

**Prerequisites: Nil**


### **Specific Objectives of course:**


To teach Thermodynamics Laws and their application to various systems & physical properties of pure substances.

### **Course Outline:**

This is the first course in Engineering Thermodynamics. It provides essential background and competence to the students to have basic know how and analyzing ability of the fundamental concept, Zeroth law and First law of Thermodynamics and its applications to various systems and physical properties of pure substances. Use of property tables, P-V-T relations, Equations of state for ideal gases, second law and its consequences, reversible and irreversible processes and cycles, entropy and its use. Study of the subject course is the pre-requisite for more advanced courses on Engineering Thermodynamics and Propulsion etc.

### **Recommended Books:**

 *An Introductory Engineering Thermodynamics by J B Jones/G A Hawkins, 2<sup>nd</sup> Edition, John Wiley, NY, 1986.*

 *AE Text Book*

 *AP 3456A*

### **World Wide Web:**

[http://tigger.uic.edu/~mansoori/Thermodynamics.Educational.Sites\\_html](http://tigger.uic.edu/~mansoori/Thermodynamics.Educational.Sites_html)

## **Title of the Course: INCOMPRESSIBLE AERODYNAMICS**

**Credit Hours: 3-0**

**Prerequisites: ME (Thermodynamics-I)**

### **Specific Objectives of course:**

To study the basic concepts of fluid flow and to calculate for us and moments action on solid object immersed in a fluid.

### **Course Outline:**

This is the first course in Aerodynamics, which covers the fundamentals of fluid dynamics. It deals with the incompressible fluid flows only and comprises two major parts. The first part deals with the fluid statistics and dynamics in which the fluid flows are analyzed and the mass flow rate, forces and energy flux are calculated. This part deals with the potential flows and their super position. Part two consists of the dimensional analysis, boundary layer theory and compares the ideal and real flows. This part mainly deals with airfoil characteristics, thin airfoil theory, high lift devices, wing characteristics, Prandtl's lifting line theory and drag on the aircraft.

### **Lab Outline:**

Experimental work on subsonic wind tunnel; wind tunnel calibration; model testing, post data resolution; measurements of pressure distribution to calculate off and drag.

### **Recommended Books:**

📖 *Fundamentals of Aerodynamics by John D Anderson by John D Anderson*

📖 *Fluid Mechanics by Frank M White*

📖 *Low speed wind tunnel testing by Pope & Harper, John wiley NY 1966*

### **Journals / Periodicals:**

Fluid Mechanics

## **Title of the Course: COMPRESSIBLE AERODYNAMICS**

**Credit Hours: 3-0**

**Prerequisites: Thermodynamics, Incompressible Aerodynamics**

### **Specific Objectives of course:**

To study the impact of density variation on the aerodynamics of a vehicle.

### **Course Outline:**

This is the second course in aerodynamics and explains the wave propagation in compressible media and gives basic equations of compressible fluid flow. Discussion includes the isentropic flow of a perfect gas. The analysis of normal, oblique and conical shock waves and Prandtl-Meyer flow is carried out along with their application to nozzle flows. The course also deals with flows with friction and heat transfer. Three dimensional flow equations are derived. Also the linearized flow theory, shock expansion theory and supersonic similarity parameters are discussed to explain the concepts of supersonic airfoil/wing design.

**Lab Outline:**

Schlieren Photographics of Shock waves

**Recommended Books:**

- 📖 *Gas Dynamics by James E A John, Allyn & Bacon, Boston, 1972.*
- 📖 *Dynamics & Thermodynamics of Compressible Flow by A H Shapiro, Vol-1*
- 📖 *Compressible Fluid Flow by B W Imrie*
- 📖 *Compressible Fluid Flow by JD Anderson*

**Title of the Course: AEROSPACE VEHICLE PERFORMANCE****Credit Hours: 3-0****Prerequisites:** Fundamental of Fluid Mechanics  
High Speed Aerodynamics**Specific Objectives of course:**

To Study the concept of flight mechanics with aircraft as a point mass

**Course Outline:**

The course introduces basic performance characteristics. It begins with an introduction to standard atmosphere and aircraft/static system of an aircraft. The course then covers a steady-state analysis of performance parameters such as endurance, aircraft ceiling, range, climb, descent and glide, take off and landing performance. Accelerated performance parameters are then evaluated using Energy State Approximation and results are compared with exact solutions. The last part of the course deals with turning performance both instantaneous and sustained.

Space: Newton law of gravity, two body problem, trajectory eqn, orbits, coordination.

Sys. Kepler's laws, trajectory designs and simulation

**Recommended Books:**

- 📖 *Aircraft Performance, Stability and Control, Vol-I by James D Lang, USAF Academy, Dept of Aeronautics, 1974.*
- 📖 *Aircraft Design: A Conceptual Approach By Daniel P Raymer*
- 📖 *Aircraft Performance and Design by John d Anderson, Jr.*
- 📖 *Introduction to Flight by John D Anderson, Jr.*
- 📖 *Duncan, Thom, and young*

**Title of the Course: AIRCRAFT STABILITY & CONTROL****Credit Hours: 3-0****Prerequisites:** Aerospace Technology, Fundamentals of Fluid Mechanics, Differential Equation**Specific Objectives of course:**

To study the stability and control of aircraft under a variety of inputs.

### **Course Outline:**

This is a major course, which gives a systematic account of aircraft stability and control. In first part of the course, the static longitudinal, directional and lateral stability with respect to aircraft axes system are studied. Effects of various major components on static stability, critical flight conditions and controls requirement are also included in this part. In second dynamic stability, the axes system inertial and rotating axes and their transformations is studied. This part also gives treatment to linearization of aircraft equations of motion, Laplace transformation, stability derivatives, transfer functions, aircraft dynamic responses to external disturbances and controls.

### **Recommended Books:**

- 📖 *Aircraft Performance Stability and Control, Vol-I by James D Lang, USAF Academy, Dept of Aeronautics, 1974*
- 📖 *Automatic Control of Aircraft by Blakelock, John Wiley, N.Y. 1965*
- 📖 *Dynamics of Flight (Stab & Control) by B. Etkin & Duff, 3<sup>rd</sup> Ed, John Wiley, NY 1996*
- 📖 *Nelson*
- 📖 *Cooke*

### **Title of the Course: AEROSPACE VEHICLE DESIGN**

#### **Credit Hours: 1-2**

**Prerequisites:** Incompressible Aerodynamics, Compressible Aerodynamic, Flight Dynamics Stability & Control, Propulsion

#### **Specific Objectives of course:**

To undertake conceptual design of an Aerospace vehicle design

#### **Course Outline:**

This deals with the conceptual design of various types and categories of aircraft. Conceptual design is basically new aircraft concept development process and consists of two major activities: design layout and design analysis. These two phases broadly cover aspects involving configuration layout, pay-load considerations, aerodynamics, propulsion, structures and loads, weights, stability and control, performance and finally trade studies. As a part of this course, the student is required to prepare and present a conceptual design of a complete aircraft based on certain specifications. Extensive use of computers would be made to refine the designed aircraft.

#### **Recommended Books:**

- 📖 *Aircraft Design: A Conceptual Approach by Raymer, 3<sup>rd</sup> Ed, AIAA Virginia, 1999*
- 📖 *Design for Air Combat by Whitford*

**Title of the Course: ENGINEERING MECHANICS-I (STATICS)**

**Credit Hours: 3-0**

**Prerequisites:** MATH Applied Algebra & Calculus I




**Specific Objectives of course:**

To study the force and moments on rigid bodies in static equilibrium.

**Course Outline:**

This is the first course in Mechanics, which concerns the general principles of statics and the equilibrium of bodies under the action of forces. The main topics included under the course are properties of forces, moments, couples and resultants; analysis of two and three-dimensional problems; and application of equilibrium principles to simple trusses, frames and machines. The course also covers special topics related to friction effects to beams and fluid statics.

**Recommended Books:**

-  *Engineering Mechanics (Statics) by J L Mariam & L G Kraige, 4<sup>th</sup> Edition, John Wiley, NY, 1998*
-  *Engineering Mechanics by Irving H Shames*
-  *Beer and Johnson (Statics) Hibbeler*

**Title of the Course: ENGINEERING MECHANICS-II (DYNAMICS)**

**Credit Hours: 3-0**

**Prerequisites:** Applied Algebra & Calculus I, Calculus II  
Engineering Statics



**Specific Objectives of course:**

To study the dynamics of practices and rigid bodies using a variety of methods with special attention to rigid body dynamics.


**Course Outline:**

The primary purpose of this course is to help the students develop the ability to visualize physical configurations in terms, actual constraints and practical limitations. The course has been divided into four parts. The first part, Kinematics of Particles, deals with a number of ways in which the motion of a particle is generated. Part two, Kinetics of Particles, is concerned with the three basic methods, force-mass-acceleration, work-energy, and impulse-momentum. In the third part, Kinematics of Rigid Bodies, the equations of relative velocity and relative acceleration are encountered. Emphasis is placed jointly on solution by vector geometry and solution by vector algebra. Part four, Kinetics of Rigid Bodies, covers the basic equations, which govern all categories of plane motion. Equation of motion in rotating frames.

**Recommended Books:**

-  *Engineering Mechanics (Dynamics) Vol II by J L Mariam & L G Kraige (S I Version 4<sup>th</sup> Edition), John Wiley, NY, 1998*
-  *Engineering Mechanics (Dynamics) by R C Hibbeler*

 *Engineering Mechanics by Higdon and Stiles*

 *Beer & Johnson (Dynamics)*

**Title of the Course: AEROSPACE MATERIALS**

**Credit Hours: 3-0**

**Prerequisites: Structural Mechanics**


**Specific Objectives of course:**

To study the properties of various materials being used in aerospace industry

**Course Outline:**

The course mainly deals with properties of various materials being used in engineering applications in general and Aerospace applications in particular. The basic physical and chemical phenomena that govern these material properties are introduced and explained. Material like metals, metal alloys, polymers, ceramics and composites are discussed and relative advantages/disadvantages highlighted with respect to engineering applications. Material degradation and failure along with corrosion effects are introduced. A brief narration on electrical, magnetic and semi-conductor materials is included towards the end of the course.

**Recommended Books:**

 *Elements of Materials Science & Engineering by Van Vlack, 4<sup>th</sup> Ed, Addison Wisley, London, 1980*

**Title of the Course: AEROSPACE STRUCTURE I**

**Credit Hours: 3-0**

**Prerequisites: Engineering Statics**

**Specific Objectives of course:**

The students should be able to understand the Finite Element concept in structures problems.

**Course Outline:**

This is the first course in computational analysis. This course is the fundamentals of Finite Element Methods in structures analysis. The course has been designed to provide the students with sufficient background for understanding the finite element methods to be able to use them for the analysis of structures. This also provides comparison of analytical approach with finite element methods. This course starts with concept of stiffness of a spring and builds up to formulate element stiffness matrix for different element using Hook's and energy theorems. Principle of Virtual Work and Minimum Potential Energy are covered under the Energy Theorems. The load vector and displacement vectors are then introduced to complete the model. Methods of solution are given to solve the model to

determine the displacements of the structure at the nodes, manually and using computer package. The students are exposed to computer for a considerable amount of time to prepare them to use then finite element methods using computers in their future assignments. Analysis of plane pin-joint trusses, rigid joined plane frames, plane and combination of these is carried out.

**Recommended Books:**

📖 *“Finite Element Methods in Structural Mechanics” by C T Ross.*

**Title of the Course: STRUCTURAL DYNAMICS**

**Credit Hours: 3-0**

**Prerequisites:** Thermodynamics, Aerodynamics

**Specific Objectives of course:**

To introduce the student the different types of vibration in aerospace vehicle, both longitudinal and lateral motion are discussed with their impact on the over all EOM.

**Course Outline:**

The course includes topics like study of elements of vibratory system, simple harmonic motion, theory and application of systems with one degree of freedom, writing of equation of motion of systems with different methods, determining solution of free and forced vibratory systems, transient vibration with impulse response and convolution integral, two degree of freedom systems with method of determining their natural frequencies, matrix methods, continuous systems, lateral vibration of beams, introduction to aeroelasticity, concepts of divergence and control effectiveness and reversal.

**Recommended Books:**

📖 *Mechanical Vibration-Theory and Applications by Francis S Tse, Ivan E Morse and R T Hinkle, 2<sup>nd</sup> Ed, Allyn & Bacon, USA, 1978*

📖 *Principles of Heat Transfer by Frank Kreith*

📖 *Heat Transfer by Holman*

**Title of the Course: AEROSPACE STRUCTURES II**

**Credit Hours: 3-0**

**Prerequisites:** Aerospace Structure-I

**Specific Objectives of course:**


To develop mathematical models for structural analysis.

**Course Outline:**

This is the advanced course in aircraft structures. The course is based on forming the equations for bending, torsion and shear in beams. The course also deals with deflection analysis of beams.

**Recommended Books:**

 *Theory and Analysis of Flight Structures* by Rivello

 *Aircraft Structures* by Peery and Azar


**Title of the Course: AEROTHERMODYNAMICS (PROPULSION)****Credit Hours: 3-0****Prerequisites:** Thermodynamics –I & II**Specific Objectives of course:**


To teach details of propulsion units including breathing engines and rocket propulsion.

**Course Outline:**

The course mainly deals with air breathing engines which include ramjet, turbojet, turbo-fan, and turbo-prop. The course starts with the review of basic topics in thermodynamics, which predict the performance of propulsion devices. Next, the details of turbo engine components, especially compressor and turbine, and their matching are discussed. In the later part of the course rocket propulsion and rocket propellants, liquid & Solid Rocket Propulsion Systems, nozzle design, rocket performance. Relevant experiments at appropriate levels are also conducted during the semester.

**Recommended Books:**

 *Mechanics & Thermodynamics of Propulsion* by P D Hill & C.R. Peterson, 2<sup>nd</sup> Ed Addison, Wesley, NY, 1992

 *Rocket Propulsion Elements* by George P Sutton, Oscar Biblarz, 6<sup>th</sup> Ed. John Wiley, NY, 1992

<http://www.rta.nato.int/Pubs/RDP.asp?RDP=AGARD-R-813>

**Title of the Course: SENIOR DESIGN PROJECT****Credit Hours: 6-0****Prerequisites:** Senior Standing**Specific Objectives of course:**

To do a complete a project independently on any aerospace topic. A good knowledge all basic aerospace subjects will be required along with specific application software.

**Course Outline:**

Students are required to complete an engineering project based upon the knowledge they have gained during BE studies.

**Title of the Course: Flight Control Systems****Credit Hours: 3-0****Prerequisites:**

1. Calculus-II and Differential Equations
2. Advanced Engineering Mathematics

### **Specific Objectives of course:**

Objective of this course to introduce fundamentals of control theory so that the student should be able to follow advance courses of aerospace system and flight dynamics control.

### **Course Outline:**


This course introduces the Aerospace majors to the fundamentals of linear control system. Initially the student is taught the mathematical modelling of physical systems, which include both electrical and mechanical systems. The Digital computer is introduced as a tool for solution of differential equations and linear systems, transient and steady state response. Classification of control systems and frequency response of feedback control system are taught during the later part of the course. Root locus, Routh's criterion and signal flow graphs are also covered. Digital computation on package CC and Matlab are used to put theory in practice.

### **Lab Outline:**

No lab is associated with this course. However MATLAB based tutorial sessions can be scheduled in theory classes for analysis and designing feedback control systems.

### **Recommended Books:**

 *Feedback Control Systems by Phillips & Harbor, 3<sup>rd</sup> Ed, Prentice Hall, USA, 1993*

 *Linear Control System Analysis and Design, By John Joachim D'Azzo, and Constantine H. Houpis, 2nd edition, McGraw Hill 1981*

### **Journals / Periodicals:**

IEEE Control Systems Magazine

### **World Wide Web:** *Control System Virtual Library*

[http://www-control.eng.cam.ac.uk/extras/Virtual\\_Library/Control\\_VL.html](http://www-control.eng.cam.ac.uk/extras/Virtual_Library/Control_VL.html)

## **Title of the Course: AEROSPACE INSTRUMENTATION**

### **Credit Hours: 2-1**

### **Prerequisites:**

1. Physics
2. Fundamentals of Electronics

### **Specific Objectives of course:**

Main objective of this course is to introduce the students with the fundamentals of measurement techniques and instrumentation systems. So that they should be able to understand instrumentation systems that are being used in and for aerospace systems.

### **Course Outline:**

Measurement and correct interpretation are necessary parts of any engineering research and development programme. Naturally, the measurements must supply reliable information and their meanings must be correctly comprehended and interpreted. This course is meant for students who have to deal with various types of test and measurement equipment at various stages of their life. It includes topics

related to process of measurement standards and dimensional units of measurement, sensors, counters, displacement and dimensional measurements, and stress & strain measurement analysis, fluid flow measurement, temperature measurement and motion measurement. Experimental portion includes use of measuring instruments like autocollimator, screw pitch measuring machine, tolerator, horizontal metro scope, interference microscope, interferometer, surface roundness testing machine and Mechanical & Electronic comparators.

### **Lab Outline:**

Besides formal lab work SPICE / MATLAB / LABVIEW based tutorial sessions can be scheduled for analysis and designing of analogue and digital instrumentation systems.

### **Recommended Books:**

- 📖 *Instrumentation for Engineering Measurements, By: by James W. Dally, William F. Riley, and Kenneth G. McConnell. John Wiley and Sons Ltd, 1988*
- 📖 *Mechanical Measurements by Thomas G Beckwith, Roy D Marangoni & John H Lienhard V, 5th Ed, Addison Wesley, NY 1993*

## **Title of the Course: English III Technical Report Writing**

**Credit Hours: 3-0**

**Annexure - A**

**Prerequisites:** English I & II

## **Title of the Course: PROBABILITY AND STATISTICS**

**Credit Hours: 3-0**

**Prerequisites:** Intermediate Mathematics

### **Specific Objectives of course:**

Fundamentals of probability including various probability distribution and laws of statistics are taught to the students to enable them to effectively analysis scientific data.

### **Course Outline:**

Representation of statistical data, measures of central tendency, variation, skewness and Kurtosis. Fundamentals of probability, discrete and continuous probability distributions i.e. binomial, Poisson, negative exponential, normal and Weibull; Sampling of mean and standard deviation by normal, Chi-square and F distributions, testing of hypothesis. Linear correlation by moments and by rank experimental verification of laws of statistics and probability.

### **Recommended Books:**

- 📖 *Introduction to Statistics by Ronald E Walpole, 3<sup>rd</sup> Ed, Macmillan, 1990*

## **PROGRAMMING LANGUAGES**

**Title of the Course: Computer Programming and Numerical Methods**

**Credit Hours: 2-1**

**Prerequisites:** Introduction to computing

**Specific Objectives of course:**

To enable students to solve complex problems of sciences and engineering using modern computers using discrete mathematical concepts.




**Course Outline:**

Introduction to digital computers, main components and functions; elements of programming, flow charts, high level languages and Fortran 77; practical training in Fortran programming. Introduction to numerical methods; polynomial, transcendental and linear systems of equations; root finding, bisection methods, Newton's methods, finite differences, interpolation, curve fitting, differentiation, integration and ordinary differential equations; errors of approximation. Practical training in application to scientific and engineering problems, introduction to Finite Element Method

**Lab Outline:**

Practice problems from sciences and engineering

**Recommended Books:**

-  *Fortran for the 90's*
-  *Numerical Analysis by Burdene & Fairs*
-  *ICL EPC Fortran Reference Manual*

**ENGINEERING MANAGEMENT**

**Annex- D**

## SCHEME OF STUDIES FOR M.E/M.Sc AEROSPACE ENGINEERING

Minimum Credits Hours = 30  
Essential Credit Hours = 21

### Breakdown of 21

Subjects	Credit Hours
<b>Fluid Dynamics/Aerodynamics Major:</b>	
Mathematics	3
Major related subjects	12
Thesis	6
<b>Solid Mechanics/Structures Major:</b>	
Mathematics	3
Major related subjects	12
Thesis	6
<b>Thermo fluids/Propulsion Major:</b>	
Mathematics	3
Major related subjects	12
Thesis	6
<b>Flight dynamics&amp; Control Major:</b>	
Mathematics	3
Major related subjects	12
Thesis	6
<b>Aerospace Vehicle Design &amp; Optimization Major</b>	
Mathematics	3
Major related subjects	12
Thesis	6
<b>Respective Major Total</b>	<b>21</b>

# DETAIL OF COURSES FOR M.E/M.Sc AEROSPACE ENGINEERING

## FLUIDDYNAMICS/AERODYNAMICS

### **Title of the Course: Advanced Aerodynamics-I: Incompressible Flows**



**Credit Hours: 3-0**

**Prerequisites: Nil**

#### **Course Outline:**

This graduate level course is first in the sequence of two advanced aerodynamics courses. The main focus of this course is on incompressible flows. Incompressible flows form a major part of aerodynamics and their analysis is broadly classified under “inviscid” and “viscous” flows. In viscous incompressible flows, further subdivisions are made on the basis of flow Reynolds number (Re) i.e. Laminar boundary layer (High Re), Stokes flow (low Re) and turbulent flow (Very high Re). The basic governing equations of fluid/aerodynamics i.e. Navier Stokes equations are introduced and their various analytical solution techniques are explained in detail. Two-dimensional incompressible and inviscid flows are solved using complex analysis treatment.

#### **Recommended Books:**

-  *Incompressible Flow 2<sup>nd</sup> Ed, by Panton, John Wiley, NY, 1996*
-  *Viscous Flow 2<sup>nd</sup> Ed, by White, McGraw-Hill, NY, 1974*

### **Title of the Course: Advanced Aerodynamics-II: Compressible Flows**



**Credit Hours: 3-0**

**Prerequisites: Nil**

#### **Course Outline:**

This graduate level course is second in the sequence of two advanced aerodynamics courses. The main focus of this course is on compressible flow. Compressible flows form a major part of aerodynamics and their analysis is broadly classified under “inviscid” and “viscous” flows. Inviscid compressible flows include analysis of properties across shocks/expansion waves, variable area flows, linearized 2-D flow, part of hypersonic flow and unsteady wave motion. Viscous compressible flows involve solution of the complete system of governing equations including Navier-Stokes equations. Various examples of viscous compressible flow are illustrated

#### **Recommended Books:**

-  *Modern Compressible Flow 2<sup>nd</sup> Ed, by Anderson, McGraw-Hill, Singapore, 1990*
-  *Viscous Flow 2<sup>nd</sup> Ed, by White, McGraw-Hill, NY, 1974*

## **Title of the Course: Computational Fluid Dynamics-1**

**Credit Hours: 3-0**

**Prerequisites: Nil**

### **Course Outline:**

This is the first course in Computational Fluid Dynamics (CFD). This includes introduction to finite difference and finite volume methods used in modern engineering. Basic concepts of discretization, consistency and stability are also introduced. Applications of numerical methods to selected model partial differential equations are carried out

### **Recommended Books:**

 *Computational Fluid Mechanics and Heat Transfer by Anderson, Tanehill, & Pletcher, Hemisphere Pub, NY 1984*

## **Title of the Course: Advanced Heat Transfer**


**Credit Hours: 3-0**


**Prerequisites: Nil**


### **Course Outline:**

This graduate level course in heat transfer is designed to cover material beyond the undergraduate level. Different modes of heat transfer, i.e. Conduction, Convection and Radiation are broadly discussed. The main focus of this course is on Conduction and Convection with some introductory material on Radiation towards the end of the course. In Conduction 2-D steady and 1-D unsteady problems are introduced and their solution methods discussed. In Convection the equations of motion, energy and mass conservation are reviewed and problems involving forced and free convection are discussed with reference to various flow regimes

### **Recommended Books:**

 *Heat Conduction by Ozisik*

 *Convective Heat Transfer 2<sup>nd</sup> Ed, by Burmeister*

 *Thermal Radiation Heat Transfer 2<sup>nd</sup> Ed, by Siegel & Howell, McGraw-Hill, 1972*

## **SOLID MECHANICS/STRUCTURES**

### **Title of the Course: Theory of Elasticity**

**Credit Hours: 3-0**

**Prerequisites: Nil**

### **Course Outline:**

This is the first course in Structures, which in its broad aspect deals with the study of elastic bodies. When the elementary methods of strength of materials are inadequate to furnish satisfactory information regarding stress distribution in engineering structures, then a resort is made to the more powerful methods of theory of elasticity. Basic equations of the theory of elasticity in different co-ordinate system, solution to plane stress and plane strain problems, Fourier transformation method and St. Venant's

principle is also introduced in the course. Solution to plates of various profiles and end conditions along with the most commonly used numerical energy methods are explained to strengthen the concepts of student to undertake the advanced courses in structures in the future semesters.

**Recommended Books:**

📖 *Theory of Elasticity by Timoshenko & Goodier, 3<sup>rd</sup> Ed, McGraw-Hill, 1970, NY*

**Title of the Course: Advanced Theory of Vibrations**

**Credit Hours: 3-0**

**Prerequisites: Nil**

**Course Outline:**

The purpose of this course is to cover comprehensive fundamental principles of vibration theory. It begins with an introduction to some basic concepts, discussion about spring, mass and damper elements, and introduction to harmonic motion and its analysis. The course then covers Free and Forced vibration of single degree of freedom (SDOF) system, damped and un-damped system. After thoroughly covering SDOF system two and multi-degrees of freedom system are covered. Special additional topics are covered at the end of the course.

**Recommended Books:**

📖 *Mechanical Vibrations by Singiresu S Rao, 3<sup>rd</sup> Ed, Addison-Wesley, Massachusetts, 1995*

**Title of the Course: Finite Element Methods-I**

**Credit Hours: 3-0**

**Prerequisites: Nil**

**Course Outline:**

The course provides an introduction to the Finite Element Method as applied to one & two-dimensional problems of structures, heat transfer & fluid flow. One-dimensional and two-dimensional, static & dynamic problems are solved by using FEM.

**Recommended Books:**

📖 *An Introduction to the Finite Element Method by J N Reddy, 2<sup>nd</sup> Ed, McGraw-Hill, NY, 1993*

## **AERODYNAMICS & PROPULSION**

### **Title of the Course: Advanced Aerodynamics-I: Incompressible Flows**

**Credit Hours: 3-0**

**Prerequisites: Nil**

#### **Course Outline:**

This graduate level course is first in the sequence of two advanced aerodynamics courses. The main focus of this course is on incompressible flows. Incompressible flows form a major part of aerodynamics and their analysis is broadly classified under “inviscid” and “viscous” flows. In viscous incompressible flows, further subdivisions are made on the basis of flow Reynolds number (Re) i.e. Laminar boundary layer (High Re), Stokes flow (low Re) and turbulent flow (Very high Re). The basic governing equations of fluid/aerodynamics i.e. Navier Stokes equations are introduced and their various analytical solution techniques are explained in detail. Two-dimensional incompressible and inviscid flows are solved using complex analysis treatment.

#### **Recommended Books:**

📖 *Modern Compressible Flow 2<sup>nd</sup> Ed. by Anderson, McGraw-Hill, Singapore, 1990*

📖 *Viscous Flow 2<sup>nd</sup> Ed, by White, McGraw-Hill, NY, 1974*

### **Title of the Course: Advanced Aerodynamics-II: Compressible Flows**

**Credit Hours: 3-0**

**Prerequisites: Nil**

#### **Course Outline:**

This graduate level course is second in the sequence of two advanced aerodynamics courses. The main focus of this course is on compressible flow. Compressible flows form a major part of aerodynamics and their analysis is broadly classified under “inviscid” and “viscous” flows. Inviscid compressible flows include analysis of properties across shocks/expansion waves, variable area flows, linearized 2-D flow, part of hypersonic flow and unsteady wave motion. Viscous compressible flows involve solution of the complete system of governing equations including Navier-Stokes equations. Various examples of viscous compressible flow are illustrated.

### **Title of the Course: Turbomachinery**

**Credit Hours: 3-0**

**Prerequisites: Nil**

#### **Course Outline:**

This course includes the theories of cascades, performance analysis of axial and radial flow compressor, pumps and turbines at design and off-design conditions.

**Recommended Books:**

📖 *Fluid Mechanics, Thermodynamics of Turbomachinery* by S L Dixon, Pergamon Press, 1966

**Title of the Course: Advanced Aerospace Propulsion****Credit Hours: 3-0****Prerequisites: Nil****Course Outline:**

This course includes the theory of rocket propulsion, flight dynamics of rocket, solid rocket, liquid rocket, heat transfer in rocket motor, and component design.

**Recommended Books:**

📖 *Rocket Propulsion Elements 6<sup>th</sup> Ed*, by Sutton, John Wiley, NY, 1992

**Title of the Course: Advanced Engineering Mathematics****Credit Hours: 3-0****Prerequisites: Nil****Course Outline:**

The course includes Vector Calculus, Tensors, Kronecker tensor, Levi-Civita tensor, differential operators in tensor form, Calculus of Variations, Brachistochrone problem, Euler-Lagrange Equations for several variables, optimization, Fibonacci Procedure, method of Lagrange multipliers, Kuhn-Tucker Conditions.

**Recommended Books:**

📖 *Introductory Linear Algebra with Applications 6<sup>th</sup> Ed*, by Bernard Kolman, Prentice Hall, USA, 1997

📖 *Partial Differential Equations for Scientists and Engineers*, by Tunde Myint-U & Lokenath Debnath, 3<sup>rd</sup> Ed, PTR Prentice Hall N J

📖 *Advanced Engineering Mathematics* by Erwin Kreysig, 8<sup>th</sup> Ed, John Wiley Singapore, 1999

📖 *Advanced Engineering Mathematics* by C Roy Wylie, 5<sup>th</sup> Ed, McGraw-Hill, London, 1982

📖 *Calculus of Variations* by Robert Weinstock, McGraw Hill, 1952

## **RECOMMENDATIONS**

The NCRC discussed at length different aspects of the curricula of Aerospace Engineering and agreed upon the recommendations given hereunder:-

1. The core courses be made compulsory in all Universities of Pakistan and a set of electives may be chosen to fulfil the complete curriculum requirement. Universities may introduce electives to meet their own peculiar requirements on the recommendations of their own Board of Studies. Similarly the text books proposed, are also meant as a guideline only.
2. At most of the public sector universities/colleges, laboratories need improvements. The education in the field of engineering, particularly in Aerospace Engineering cannot be imparted without practical experiments and hands-on practices. Special attention and additional funds may be provided to equip the laboratories. For core subjects, laboratory work is deemed absolutely essential.
3. There is an urgent need to commence a Teachers Training Programme to assimilate modern technologies and for the enhancement of instructional methodologies.
4. Trained and qualified manpower may be inducted on emergency basis to overcome the faculty shortage.
5. Special incentives may be devised for good teachers and students for their encouragement.
6. Engineering universities/colleges may be connected through LAN & WAN so that teachers and students may use Internet facility for R&D widely. This connectivity would result in useful interaction between the students, researchers and the faculty.
7. Use and application of simulation software tools may be introduced to students for the research/development work at appropriate levels.
8. For Mini Projects and Final Year Projects, laboratories should be well equipped with components, devices and equipment of common use.
9. Final year projects should involve analysis, design and practical work. The examination for the project should include an open-house formal presentation by the students. Efforts may also be made to invite representatives from the local industry.
10. The Committee is fully cognizant of the need for very strong interaction amongst the universities on academic matters.

Therefore, all universities are requested to disseminate any changes in their curricula to others as well.

11. All engineering institutions should encourage internship training, spanning 4 to 6 weeks for their students in the local industry. The Committee strongly opines that in order to ensure participation of our industry, a legal framework needs to be evolved at the provincial and Federal Government levels.
12. Subject to availability of teaching faculty, engineering institution may also offer humanities courses in Philosophy, Logic and Human Resource Development also.
13. The teaching faculty may be encouraged to attend short courses, seminars and workshops in country and abroad.

# COMPULSORY COURSES IN ENGLISH FOR BE/BSc IN ENGINEERING DISCIPLINE

## Semester – I

### Functional English

**Objectives:** To enhance language skills and develop critical thinking

### Course Contents

Basics of Grammar  
Parts of speech and use of articles  
Sentence structure, Active and passive voice  
Practice in unified sentence  
Analysis of phrase, clause and sentence structure  
Transitive and intransitive verbs  
Punctuation and spelling

### **Comprehension**

Answers to questions on a given text

### **Discussion**

General topics and every day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

### **Listening**

To be improved by showing documentaries/films carefully selected by subject teachers)

### **Translation skills**

Urdu to English

### **Paragraph writing**

Topics to be chosen at the discretion of the teacher

### **Presentation skills**

Introduction

**Note: Extensive reading is required for vocabulary building**

### Recommended books:

#### **1. Functional English**

##### **a) Grammar**

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

- b) Writing
  - 1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
- c) Reading/Comprehension
  - 1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.
- d) Speaking

## **Semester II**

### **Communication Skills**

#### **Objectives:**

To enable the students to meet their real life communication needs

#### **Course Contents**

##### **Paragraph writing**

Practice in writing a good, unified and coherent paragraph

##### **Essay writing**

Introduction

##### **CV and job application**

##### **Translation skills**

Urdu to English

##### **Study skills**

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

##### **Academic skills**

Letter / memo writing and minutes of the meeting, use of library and internet recourses

##### **Presentation skills**

Personality development (emphasis on content, style and pronunciation)

#### **Note: documentaries to be shown for discussion and review**

#### **Recommended books:**

##### **Communication Skills**

- a) Grammar
  - 1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

## b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

## c) Reading

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
2. Reading and Study Skills by John Langan
3. Study Skills by Richard Yorke.

## **Semester III**

### **Technical Writing and Presentation Skills**

#### **Objectives:**

To enhance language skills and develop critical thinking

#### **Course Contents**

##### **Presentation skills**

##### **Essay writing**

Descriptive, narrative, discursive, argumentative

##### **Academic writing**

How to write a proposal for research paper/term paper

How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

##### **Technical Report writing**

##### **Progress report writing**

**Note: Extensive reading is required for vocabulary building**

#### **Recommended books:**

##### **Technical Writing and Presentation Skills**

- a) Essay Writing and Academic Writing
  1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0

19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).

2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.
3. Patterns of College Writing (4<sup>th</sup> edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.

b) Presentation Skills

c) Reading

The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

**ISLAMIC STUDIES (Compulsory)****COURSE PROFILE**

S.NO	TITLES	DETAIL
1	Name of Course	Islamic Studies( Compulsory)
2	No. of Credit Hours	2 Credit Hours
3	Nature of Course	Compulsory at Graduation Level
4	Total Teaching Weeks	18
5	Objectives of the Course	This course is aimed at: 1-To provide Basic information about Islamic Studies 2-To enhance understanding of the students regarding Islamic Civilization 3-To improve Students skill to perform prayers and other worships 4-To enhance the skill of the students for understanding of issues related to faith and religious life
6	Components of Teaching of the Course	

LEVEL OF COURSE	GRADUATION
NAME OF DEGREE	BS
NAM OF COURSE	ISLAMIC STUDIES
SEMESTER	AS PER REQUIREMENT OF THE UNIVERSITY
NO. OF CREDIT	2
TOTAL TEACHING HOURS	AS PER HEC REQUIRMENTS
NO. OF PERIODS PER WEEK	2
TOTAL TEACHING PERIOD OF COURSE	18 WEEKS

**UNIT NO.1: INTRODUCTION TO QURANIC STUDIES**

- 1) Basic Concepts of Quran
- 2) History of Quran
- 3) Uloom-ul -Quran

**UNIT No.2 : STUDY OF SELLECTED TEXT OF HOLLY QURAN**

- 1) Verses of Surah Al-Baqra Related to Faith(Verse No-284-286)
- 2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- 3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- 4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- 5) Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154)

### **UNIT No.3 : STUDY OF SELLECTED TEXT OF HOLLY QURAN**

- 1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- 2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- 3) Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

### **UNIT NO.4: SEERAT OF HOLY PROPHET (S.A.W) I**

- 1) Life of Muhammad Bin Abdullah ( Before Prophet Hood)
- 2) Life of Holy Prophet (S.A.W) in Makkah
- 3) Important Lessons Derived from the life of Holy Prophet in Makkah

### **UNIT NO.5: SEERAT OF HOLY PROPHET (S.A.W) II**

- 1) Life of Holy Prophet (S.A.W) in Madina
- 2) Important Events of Life Holy Prophet in Madina
- 3) Important Lessons Derived from the life of Holy Prophet in Madina

### **UNIT NO.6: INTRODUCTION TO SUNNAH**

- 1) Basic Concepts of Hadith
- 2) History of Hadith
- 3) Kinds of Hadith
- 4) Uloom –ul-Hadith
- 5) Sunnah & Hadith
- 6) Legal Position of Sunnah

### **UNIT NO.7 SELLECTED STUDY FROM TEXT OF HADITH**

### **UNIT NO.8 INTRODUCTION TO ISLAMIC LAW & JURISPRUDENCE**

- 1) Basic Concepts of Islamic Law & Jurisprudence
- 2) History & Importance of Islamic Law & Jurisprudence
- 3) Sources of Islamic Law & Jurisprudence
- 4) Nature of Differences in Islamic Law
- 5) Islam and Sectarianism

### **UNIT NO.9: ISLAMIC CULTURE & CIVILIZATION**

- 1) Basic Concepts of Islamic Culture & Civilization
- 2) Historical Development of Islamic Culture & Civilization
- 3) Characteristics of Islamic Culture & Civilization
- 4) Islamic Culture & Civilization and Contemporary Issues

### **UNIT NO.10:ISLAM & SCIENCE**

- 1) Basic Concepts of Islam & Science
- 2) Contributions of Muslims in the Development of Science
- 3) Quranic & Science

### **UNIT NO.11:ISLAMIC ECONOMIC SYSTEM**

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics
- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

### **UNIT NO.12: POLITICAL SYSTEM OF ISLAM**

- 1) Basic Concepts of Islamic Political System
- 2) Islamic Concept of Sovereignty

- 3) Basic Institutions of Govt. in Islam

### **UNIT NO.13: ISLAMIC HISTORY**

- 1) PERIOD OF KHLAFT-E-RASHIDA
- 2) PERIOD OF UMMAYYADS
- 3) PERIOD OF ABBASIDS

### **UNITNO.14 : SOCIAL SYSTEM OF ISLAM**

- 1) BASIC CONCEPTS OF SOCIAL SYSTEM OF ISLAM
- 2) ELEMENTS OF FAMILY
- 3) ETHICAL VALUES OF ISLAM

### **REFERENCE BOOKS:**

- 1) HAMEED ULLAH MUHAMMAD, "**Emergence of Islam**", IRI, ISLAMABAD
- 2) HAMEED ULLAH MUHAMMAD, "**Muslim Conduct of State**"
- 3) HAMEED ULLAH MUHAMMAD, "**Introduction to Islam**"
- 4) MULANA MUHAMMAD YOUSAF ISLAHI,"
- 5) Hussain Hamid Hassan, "**An Introduction to the Study of Islamic Law**" leaf Publication Islamabad, Pakistan.
- 6) Ahmad Hasan, "**Principles of Islamic Jurisprudence**" Islamic Research Institute, international Islamic University, Islamabad (1993)
- 7) Mir Waliullah, "**Muslim Jrisprudence and the Quranic Law of Crimes**" Islamic Book Service (1982)
- 8) H.S. Bhatia, "**Studies in Islamic Law, Religion and Society**" Deep & Deep Publications New Delhi (1989)
- 9) Dr. Muhammad Zia-ul-Haq, "**Introduction to Al Sharia Al Islamia**" Allama Iqbal Open University, Islamabad (2001)

# Pakistan Studies (Compulsory)

(As Compulsory Subject for Degree Students)

## Introduction / Objectives

The course has been designed as a compulsory subject for the students studying for Bachelor’s degree, general or professional. The course is of 3 credit hours carrying 100 marks (recommended). The teaching work is comprised of three dimensions: Historical Perspective (20%); Government and Politics (40%); and Contemporary Pakistan (40%).

The course framework is issue-oriented. It has many dimensions, the historical and ideological background of Pakistan the process of governance and national development as well as the issues arising in the modern, age and posing challenges to Pakistan. The course has been designed with a vision that Pakistan Studies should open a window to future.

## Course Outline

### 1. Historical Perspective

- a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
- b. Factors leading to Muslim separatism
- c. People and Land
  - i. Indus Civilization
  - ii. Muslim advent
  - iii. Location and Geo-Physical features.

### 2. Government and Politics in Pakistan

Political and constitutional phases:

- a. 1947-58
- b. 1958-71
- c. 1971-77
- d. 1977-88
- e. 1988-99
- f. 1999 onward

### 3. Contemporary Pakistan

- a. Economic institutions and issues
- b. Society and social structure

- c. Ethnicity
- d. Foreign policy of Pakistan and challenges
- e. Futuristic outlook of Pakistan

### **Books Recommended**

1. Burki, Shahid Javed. *State & Society in Pakistan*, The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy*. Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. *Pakistan's Foreign policy: An Historical analysis*. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development*. Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Banglades.*, Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno - National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development*. Kent England: WmDawson & sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh*. Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan*. Boston: Houghton Mifflin, 1967.
12. Aziz, K.K. *Party, Politics in Pakistan*, Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, *Pakistan Under Martial Law*, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective*. Islamabad: National Commission on Historical and Cultural Research, 1993.

## **COURSES FOR SOCIAL SCIENCE**

### **Sociology and Development** (For Engineers)

Objectives: The main objective of this course is to apprise potential engineers about social factors that contribute towards enhancing their professional performance for the good of society and the country. This course is culture specific and has to be taught within the context of local and national socio-economic environment. The engineers are expected to supervise several people in different capacities and their understanding about human behaviour is critical for their optimum performance. Modification of human behaviour or getting work done from sub-ordinates and seniors remain a major challenge for all the professional engineers. This course will enhance understanding about the determinants of human behaviour, which ultimately will result in improved individual efficiency.

#### **1. Introduction to Sociology**

- 1.1 What is sociology?
- 1.2 Nature, Scope, and Importance of Sociology
- 1.3 Social Interactions
- 1.4 Social Groups
- 1.5 Social Institutions

#### **2. Culture and Related Concepts**

- 2.1 Definition of Culture
- 2.2 Types of Culture
- 2.3 Elements of Culture
- 2.4 Role of Culture in Organization
- 2.5 Socialization and Personality

#### **3. Interpersonal Relations**

- 3.1 Interpersonal Behaviour
- 3.2 Formation of Personal Attitudes
- 3.3 Language and Communication
- 3.4 Motivations and Emotions
- 3.5 Public Opinion

#### **4. Social Stratification**

- 4.1 Factors of Social Stratification
- 4.2 Caste and class
- 4.3 Power, Prestige, and Authority
- 4.4 Social Mobility
- 4.5 Migration

#### **5. Human Ecology**

- 5.1 Ecological Processes
- 5.2 Ecosystem and energy
- 5.3 Ecosystem and Physical Environment
- 5.4 Solid Waste Disposal
- 5.5 Pollution

#### **6. Population Dynamics**

- 6.1 World Population Growth and Distribution
- 6.2 Population Dynamics in Pakistan

- 6.3 Causes and Consequences of Urbanization
- 6.4 Population Policy in Pakistan
- 6.5 Population and Development

## **7. Community Development**

- 7.1 Meaning, Scope, and Subject Matter of Community Development
- 7.2 Processes of Community Development
- 7.3 Community Development Programs in Pakistan
- 7.4 Community Organization and Related Services
- 7.5 Cooperation and Conflict in Community Development

## **8. Deviance and Crime**

- 8.1 Crime as a Social and Cultural Phenomenon
- 8.2 Crime and Social Organization
- 8.3 Organized Crime
- 8.4 Culture Based Crime
- 8.5 Economics of Crime

## **9. Sociology of Change and Development**

- 9.1 What is Social Change and Development?
- 9.2 Dynamics of Social Change
- 9.3 Role of NGOs in Development
- 9.4 World System and Development
- 9.5 Gender and Development

## **Recommended Readings**

1. Allport, G. W. (1985). The Historical Background of Modern Social Psychology. New York, Random House.
2. Bernard, A. and T. Burgess (2004). Sociology, Cambridge University Press.
3. DuBrin, A. J. (2007). Human Relations: Interpersonal Job Oriented Skills. New York, Prentice Hall.
4. Gardezi, H. N., Ed. (1991). Understanding Pakistan: The Colonial Factor in Societal Development. Lahore, Maktaba Fikr-o-Danish.
5. Hafeez, S. (1991). Changing Pakistan Society. Karachi, Royal Book Company. Gardezi, H. N., Ed. (1991).
6. Jones, G. W. (2005). "Why are Population and Development Issues not Given Priority?" Asia-Pacific Population Journal **20**(1).
7. Macionis, J. J. (1999). Sociology 7<sup>th</sup> Edition, National Book Foundation, Islamabad
8. Maser, C. (1997). Sustainable Community Development: Principles and Concepts. Florida St. Lucie Press.
9. Nelson, N. and S. Wright (1995). Power and Participatory Development: Theory and Practice. London, Intermediate Technology Publications.
10. Syed, S. H. (2003). The State of Migration and Multiculturalism in Pakistan: The Need for Policy and Strategy. Islamabad, UNESCO: 1-30.
11. Utton, A. E. (1976). Human Ecology, West View Press.
12. Webster, A. (1990). Introduction to Sociology of Development. London, Nacmillan Education Ltd.

13. Weiss, A. M. (2001). *Power and civil society in Pakistan*, Oxford University press.

## **SOCIAL ANTHROPOLOGY**

### **(For Engineers)**

Objectives: The students are expected to learn anthropological skills for application by professional engineers and other related practitioners. Societal growth needs are to be understood within our own cultural environment. Such a body of applied knowledge will result in improving the professional performance of would-be engineers. As culture and society play an important role towards all human activities, this course will help students relate technical skills to the societal needs and requirements.

#### **I Introduction**

1. Anthropology and Social Anthropology
2. Fields of Anthropology
3. Anthropological Research Methods
4. Social Anthropology and other Social Sciences
5. Significance of Social Anthropology

#### **II Culture**

1. Definition, Properties and Taxonomy
2. Evolution of Growth and Culture
3. Evolution of Man: Religious and Modern Perspectives
4. Evolution of Culture
5. Culture and Personality

#### **III Evolution and Growth of Culture**

1. Evolution of Man
2. Schools of Thought in Cultural Anthropology
3. Acculturation
4. Enculturation
5. Ethnocentrism and Xenocentrism

#### **IV Language and Culture**

1. Communication
2. Structural Linguistics
3. Historical Linguistics
4. Relationship between Language and Culture
5. Ethnography

#### **V Economic System**

1. Global Economic System
2. The Allocation of Resources
3. The Conversion of Resources
4. The Distribution of Goods and Services
5. Poverty and Inequality

#### **VII Marriage and Family**

1. Marriage and Mate Selection
2. The Family: Types and Functions
3. Kinship System
4. Structure and Function of Family

5. Gender Relations
- VIII Political Organization**
  1. Political Sociology
  2. Origin of Political Organization and Organizational System
  3. Types of Political Organizations
  4. Power Politics and Factionalism in Pakistan
  5. Resolution of Conflict

**IX Religion and Magic**

1. The Universality of Religion
2. Comparative Religions
3. Religion and Society
4. Religious Beliefs and Practices
5. Witchcraft and Sorcery

**XI Culture Change**

1. Forms of Art
2. Expressive Culture
3. Process of Cultural Change
4. Cultural Change in the Modern World
5. Cultural Change in Pakistani society

**Recommended Books**

1. Ahmad, Akbar S. 1990. *Pakistani Society*, Karachi, Royal Books Co.
2. Bernard, H. Russel. 1994. *Research Methods in Anthropology, Qualitative and Quantitative Approaches*. London: Sage Publications
3. Bodley, John H. 1994. *Cultural Anthropology*, California: Mayfield Publishing Co.
4. Brogger, Jan. 1993. *Social Anthropology and the Lonely Crowd*. New Delhi: Reliance Publishing
5. Ember, Carol R. & Ember Melvin. 2005. *Anthropology*, 11<sup>th</sup> ed. Englewood Cliffs: Prentice Hall, Ince. Harper and Row
6. Harris Marvin. 1987. *Cultural Anthropology*. New York: Harper and Row
7. Harris Marvin. 1985. *Culture, People, nature; An Introduction to General Anthropology* London: Harper and Row
8. Haviland, W. A. (2005). *Anthropology: The Human Challenge*. New York, Thomson Learning Inc.
9. Hertzler J. O. 1981. *The Social Structure of Islam*. Cambridge: Cambridge University Press.
10. Keesing, Roger m. 1998. *Cultural Anthropology: A contemporary perspective*. 3<sup>rd</sup> ed. New York: Harcourt Brace College Publishers.
11. Kottak, Conard Phillip. 2002. *Anthropology: The Exploration of Human Diversity*. 9<sup>th</sup> ed. Boston: McGraw Hill Higher Education.
12. Kennedy, Charles H. 1992. *Pakistan* London: Westview Press,.
13. Marron, Stanley. 1057. *Pakistani Society and Culture*. New Heaven
14. Wilson, Richard A. 1996. *Human Rights, Culture and Context: Anthropological Perspective*. London: Pluto Press.

## **Psychology courses for B.Sc/B.E in Engineering Programme**

Course-I **Understanding Psychology and Human Behaviour** 3 credit hrs

- What is Psychology?
- Nature, Scope and Application with Special Reference to Pakistan
- Different Schools of Psychology
- Methods of Psychology
- Learning
- Intelligence and Artificial Intelligence
- Personality and its Assessment
- Understanding Maladjustive Behaviour
- Positive Emotional States and Processes
- Stress Management and Anger Management

### **Books Recommended**

1. Atkinson R.C., & Smith E.E. (2000), Introduction to Psychology (13<sup>th</sup> ed.), Harcourt Brace College Publishers.
2. Fernald, L.D., & Fernald, P.S. (2005), Introduction to Psychology, USA: WMC Brown Publishers.
3. Hergenhahn, B.R. (2001). An Introduction to the History of Psychology, New York: Wadsworth.
4. Goodwin, C.J, (2000) Research in Psychology: Methods and Design, (3<sup>rd</sup> ed.), New York: John Wiley & Sons.
5. Synder, C.R., & Lopez, S.J. (2007) Positive Psychology, USA, Sage Publications.
6. Allen, B.P. (1997), Personality Theories: Development, Growth and Diversity, (2<sup>nd</sup> Ed.), Boston: Allyn & Bacon.
7. Cohen, R.J., & Swerdlik, M.E. (2005) Psychological Testing & Assessment (6<sup>th</sup> ed.), New York: McGraw-Hill.
8. Corcini, R., (2000). Current Psychotherapies. London: Thompson & Co Publishers.
9. Comer, R.J. (2004). Abnormal Psychology, USA: Freeman & Company.
10. Schwartz, B., Wasserman, E., & Robbins, S. (2002), Psychology of Learning and Behaviour, 5<sup>th</sup> Ed. Norton and Company.

Course II **Professional Psychology** 3 credit hrs

- Introduction to Professional Psychology
- Psychological Testing
- Educational Psychology
- Industrial/Organizational Psychology
- Social Psychology
- Health Psychology
- Clinical Psychology
- Positive Psychology

- Legal, Ethical, and Professional Issues.

### Books Recommended

1. Crow, L., & Crow, A. (2000) Educational Psychology, New Delhi: Euroasia Publishing House Ltd.
2. Spiegel, P.K., & Koocher, G.P. (1998), Ethics in Psychology, New York: Oxford University Press
3. Snyder, C.R., & Lopes, S.J. (2000), Handbook of Positive Psychology, New York: Oxford University Press.
4. Compton, W.C. (2005), Introduction to Positive Psychology, USA, Thomson Wadsworth.
5. Debra, L.N. & James Compbell Quick, (2000) Organizational Behaviour (3<sup>rd</sup> ed), Cincinnati: South Western.
6. Fred Luthans, Alexander, D.S. & Edwin, A. Locke (2000) (Eds), Handbook of Principles of Organizational Behaviour, London: Blackwell.
7. Brannon, L.& Reist, J. (2000), Health Psychology: An Introduction to Behaviour and Health (4<sup>th</sup> ed.), USA Wadsworth.
8. Donohue, W. & Ferguson, K. (Eds), (2003), Handbook of Professional Ethics for Psychologists; Issues, Questions and Controversies, London: Sage Publications.
9. Meyers, D. (2005), Social Psychology, 8<sup>th</sup> Ed. McGraw Hill Inc.
10. Cooper, J. & Hogg, M. (2003) Handbook of Social Psychology, Sage Publications
11. Halgin, R.P., Whitbourne, S.K., & Halgin, R. (2004), Abnormal Psychology: Clinical Perspectives on Psychological Disorders, New York: McGraw Hill.
12. Thorndike R.L., & Hage, E.P. (1995), Measurement and Evaluation in Psychology and Education (4<sup>th</sup> Ed), New York, MacMillan.

## **PROFESSIONAL ETHICS**

### Course Description:

**Prerequisite:       None**

**Corequisite:       None**

This course introduce contemporary and controversial ethical issues facing the business community. Topics include moral reasoning, moral dilemmas, law and morality, equity, justice and fairness, ethical standards, and moral development. Upon completion, students should be able to demonstrate an understanding of their moral responsibilities and obligations as members of the workforce and society.

### Course Objectives:

At the completion of the course requirements, the student will be able to:

- a. Define business ethics
- b. Describe the evolution of business ethics

- c. Describe major ethical perspectives
- d. Understand and apply an ethical decision-making framework
- e. Understand social responsibility from several dimensions
- f. Understand how the organization influences ethical decision-making
- g. Examine how significant others influence ethical decision-making
- h. Develop an effective ethics programme.
- i. Understand international business ethics.

### **Course Outline:**

**An Overview of Business Ethics:** Business Ethics Defined, Social Responsibility, and Business Ethics, The Development of Business Ethics, Why study Business Ethics?, Framework for Studying Business Ethics.

**Ethical issues in Business:** Foundation of Ethical Conflict, Classifications of Ethical Issues, Ethical Issues Related to Participants and Functional Areas of Business, Recognizing an Ethical Issue.

**Applying Moral Philosophies to Business Ethics:** Moral Philosophy Defined, Moral Philosophy Perspectives.

**Social Responsibility:** The Economic Dimension, The legal Dimension, The Ethical Dimension, the Philanthropic Dimension.

**An Ethical Decision-Making Framework:** Ethical Issue Intensity, Individual Factors: Stages of Cognitive Moral Development, Corporate Culture, Significant others, Opportunity, Business Ethics Evaluations and Intentions, Using the Ethical Decision-Making Framework to Improve Ethical Decisions.

**How the Organization Influences Ethical Decision Making:** Organizational Structure and Business Ethics, the role of Corporate Culture in Ethical Decision-Making, Group Dimensions of Organizational Structure and Culture, Implications of Organizational Relationships for Ethical Decisions.

**The Role of Opportunity and Conflict:** Opportunity, Conflict.

**Development of an Effective Ethics Programme:** An Effective Ethical Compliance Programme, Codes of Ethics and Compliance Standards, High-Level Manager's Responsibility for Ethical Compliance Programme and the Delegation of Authority, Effective Communication of Ethical Standards, Establishing Systems to Monitor, Audit, and Enforce Ethical Standards, Continuous Improvement of the Ethical Compliance Programme, The Influence of Personal Values in Business Ethics Programmes, The Ethical Compliance Audit.

**International Business Ethics:** Ethical Perceptions and International Business, Culture As a Factor in Business, Adapting Ethical Systems to a Global Framework: Cultural Relativism, the Multinational Corporation, A universal Set of Ethics, Ethical Issues Around the Globe.

### **Text Books:**

- Ferrell, O.C., and Fraedrich, John, Ethical Decision Making and Cases, New York: Houghton Mifflin.

- Introduction to Organizational Behaviour
  - Organizational Disciplines and topics
  - Psychological Perspective
  - Social-Psychological Perspectives
- Structure and Control in Organization
  - Introduction
  - Bureaucracy
  - Managerial Work
  - Contingency theory
  - Organizational Design
- Individual and Work Learning
  - Learning Theories
  - Learning and Work
- Stress
  - Types of Stress and Work
  - Occupational Stress Management
- Individual Differences
  - Personality and its factors
  - Personality dimensions and social learning
  - Intelligence
- Motivation and Job Satisfaction
  - Needs at Work
  - Theories of Motivation and job satisfaction
  - Correlates of Job satisfaction
  - Correlates of Job satisfaction
- Group and Work
  - Social Interaction
  - Dramaturgy and impression Management
  - Social Skill
- Group and Inter group Behaviour
  - Group Structure & Norms
  - Group Processes
  - How throne Studies
- Leadership
  - Leadership as an attribute
  - Leadership Style
- Patterns of Work
  - Work-the classical approach
  - Marx, Weber, & The critique of labor
  - Foucault & Disciplinary Power
- Conflict and Consent in Work
  - The labor Process debate

- Work place control and resistance
- Industrial conflict and industrial relations
- Organizational culture
  - Organizational culture and strategic management
  - Exploring organizational culture
  - Evaluating concept of culture

### **Books Recommended:**

1. Finchan, R., & Rhodes, P. (2003), Principles of Organizational Behaviour, 3<sup>rd</sup> Oxford.
2. Noe, R., Hollenbeck, J. Gerhart, B., & Wright, P. (2006), Human Resource Management, 5<sup>th</sup> ed., McGraw Hill.
3. Newstrom John W. (2007), Organizational Behaviour, (12<sup>th</sup> Ed), McGraw Hill.
4. Luthan Fred, (2005), Organizational Behaviour, McGraw Hill Inc.
5. Robins, Stephen, (2005), Organizational Behaviour, McGraw Hill Inc.

## **INTRODUCTION TO SOCIOLOGY**

3 Credit Hrs

- The Nature of Sociology
  - The study of social life
  - Exploring the global village
  - Sociology as a science
  - The Sociological imagination
  - The development of Sociology
  - Pioneers of Sociology
  - Nature, scope and subject matter of Sociology
  - Brief historical development of Sociology
  - Society and community
  - Relationship with other social sciences
  - Social Interaction Processes
- Social groups
  - Definition and functions
  - Types of social groups
- Social institutions
  - Definition
  - Structure and function of social institutions
  - Inter-relationships among various social institutions
- Culture and related concepts
  - Definition and aspects of culture
  - Elements of culture
  - Organization of culture
  - Other concepts, cultural relativism, sub cultures, ethnocentrism, culture lag
- Socialization and personality
  - Role and status
  - Socialization

- Culture and personality
- Deviance and social control
  - Definition and types of deviance
  - Juvenile delinquency
  - Formal and information methods of social control
- Social stratification
  - Approach to study social stratification
  - Caste class and race as basics of social stratification
- Major perspectives in Sociology
  - Functionalist perspective
  - Conflict perspective
  - Interactionstic perspective
- Social Control and deviance
  - Agencies of social control
- Social stratification
  - Determinants of social stratification
  - Social mobility, types and definition
  - Dynamics of social mobility
- Concept of social movement
  - Theories of social movement
  - Social and cultural change
- Social and cultural change
  - Definition of social change
  - Dynamics of social change
  - Impact of globalization on society and culture
  - Resistance to change
- Collective behaviour
  - Definition
  - Characteristics
  - Causes
  - Types
  - Social movements
  - Mob and crowd behaviour

### **Books Recommended**

1. Neulreck, Kenneth, J. 2005, Sociology: Diversity, Conflict and Change, Boston
2. Barnard, Andy. 2004. Sociology, Cambridge University Press
3. Giddens, Anthony, 2004, Sociology 4<sup>th</sup> edition, Cambridge Polity Press
4. Albrow, Martin, 2003, Sociology, London Routledge.
5. Richard, T. Schaefer, 2003, Sociology 5<sup>th</sup> edition, McGraw Hill College
6. Kendall, Diana, 2004. Sociology in our Times, 4<sup>th</sup> ed, Wadsworth

7. Tyler Melissa, Wallace Claire & Abbott Pamela, 2005, An Introduction to Sociology, 3<sup>rd</sup> ed. Routledge.

## **CRITICAL THINKING**

**3 Credit Hrs**

- The Power of Critical Thinking
  - Claims and Reasons
  - Reasons and Arguments
  - Arguments in the Rough
- The Environment of Critical Thinking
  - Perils of Haunted Mind
  - Self and the Power of the Group
  - Subjective and Social Relativism
  - Skepticism
- Making Sense of Arguments
  - Arguments Basics
  - Patterns
  - Diagramming Arguments
  - Assessing Long Arguments
- Reasons for Belief and Doubt
  - Conflict Experts and Evidence
  - Personal Experience
  - Fooling Ourselves
  - Claims in the News
- Faulty Reasoning
  - Irrelevant Premises
  - Genetic Fallacy, Composition, Division
  - Appeal to the Person, Equivocation, Appeal to Popularity
  - Appeal to Tradition, Appeal to Ignorance, Appeal to Emotion
  - Red Herring, Straw Man
- Unacceptable Premises
  - Begging the Question, False Dilemma
  - Slippery Slope, Hasty Generalization
  - Faulty Analogy
- Deductive Reasoning: Propositional Logic
  - Connectives and Truth Values
  - Conjunction, Disjunction, Negation
  - Conditional, Checking for Validity
  - Simple Arguments, Tricky Arguments
  - Streamlined Evaluation
- Deductive Reasoning: Categorical Logic
  - Statements and Classes
  - Translations and Standard Form
  - Terms, Quantifiers
  - Diagramming Categorical Statements

- Sizing up Categorical Syllogisms
- Inductive Reasons
  - Enumerative Induction
  - Sample Size, Representativeness, Opinion Polls
  - Analogical Induction
  - Casual Arguments, Testing for Causes
  - Casual Confusions
- Inference to the Best Explanation
  - Explanations and Inference
  - Theories and Consistency
  - Theories and Criteria
  - Testability, Fruitfulness, Scope, Simplicity
  - Conservatism
- Judging Scientific Theories
  - Science and Not Science
  - The Scientific method, Testing Scientific Theories
  - Judging Scientific Theories
  - Copernicus versus Ptolemy, Evolution Versus Creationism
  - Science and Weird Theories
  - Making Weird Mistakes
  - Leaping to the Weirdest Theory, Mixing What Seems with What is
  - Misunderstanding the Possibilities
  - Judging Weird Theories
  - Crop Circles, Talking with the Dead

### **BOOKS RECOMMENDED**

1. Vaughn Lewis, 2005, The Power of Critical Thinking, Oxford University Press.
2. Paulsen David W., Cederblom Jerry:2000, Critical Reasoning, Wadsworth
3. Restall Greg. 2005, Logic: An Introduction, Routledge

### **INTRODUCTION TO PHILOSOPHY**

3 Credit Hrs

- Definition and Nature of Philosophy
- Theory of Knowledge
  - Opinion and Knowledge
  - Plato, the Republic Selection
  - Knowledge through Reason
  - Descartes Meditation on First Philosophy
  - Knowledge through Experience
  - Hume an Inquiry concerning Human Understanding (Selection)
  - Experience Structured by the Mind
  - Kant Critique of Pure Reason (Selection)
  - Knowing and Doing

- James Pragmatism (Selection)
- Knowledge and Emotion
- Jaggar Love and Knowledge (Selection)
- Philosophy of Religion
  - Proving that Existence of God
  - Anselm, Aquinas, Paley, Dawkins (Selection)
  - Justifying Religious Beliefs
  - Pascal Pensees (Selection)
  - James The will to Believe Selection
  - Freud the Future of An Illusion (Selection)
  - Confronting the Problems of Evil
  - Mackie Evil and Omnipotence (Complete)
  - Hick Philosophy of Religion (Selection)
- Metaphysics
  - Idealism and Materialism
  - Berkeley Three Dialogues Between Hylas and Pholonous (Selection)
  - Armstrong Naturalism, Materialism and First Philosophy (Selection)
  - The Mid-Body Problem
  - Descartes Meditations on First Philosophy (Selection)
  - O'Hear Introduction to the Philosophy of Science (Selection)
  - Dennett The Origins of Selves (Complete)
  - Pali Canon (Selection)
  - Penelhum Religion and Rationality (Selection)
- Freedom to Choose
  - Libertarianism
  - James The Dilemma of Determinism (Selection)
  - Taylor Metaphysics (Selection)
  - Determinism
  - Hospers Meaning and Free Will (Selection)
  - Skinner Walden Two (Selection)
  - Compatibilism
  - Stace Religion and the Modern Mind (Selection)
  - Radhakrishnan Indian Philosophy (Selection)
- Ethics
  - Fulfilling Human Nature
  - Aristotle Nicomachean Ethics (selection)
  - Loving God
  - Augustine The Morals of the Catholic Church and the City of God (Selection)
  - Following Natural Law
  - Aquinas Summa Theologiae (Selection)
  - Doing One's Duty
  - Kant Fundamental Principles of the Metaphysics of Morals (Selection)
  - Maximizing Utility
  - Mill Utilitarianism (Selection)

- Turning Values of Upside Down
- Nietzsche Human, All too Human and Beyond Good and Evil (Selection)
- Creating Ourselves
- Sartre Existentialism is a Humanism (Selection)
- Hearing the Feminine Voice
- Gilligan In a Different Voice (Selection)
- Baier What do Women Want in a Moral Theory (Selection)
- Political and Social Philosophy
  - The State as Natural
  - Plato the Republic (Selection)
  - Aristotle Politics (Selection)
  - The State as a Social Contract
  - Hobbes Philosophical Rudiments Concerning Government and Society (Selection)
  - Locke the Second Treatise of Government (Selection)
  - Liberty of the Individual
  - Mill On Liberty (Selection)
  - Alienation in Capitalism
  - Marx Economic and Philosophic Manuscripts of 1844 (Selection)
  - Justice and Social Trust
  - Rawls A Theory of Justice (Selection)
  - Nozick Anarchy, State, and Utopia (Selection)
  - Held Rights and Goods (Selection)
  - Women in Society
  - Wollstonecraft A Vindication of the Rights of Women (Selection)
  - De Behaviour The Second Sex (Selection)
  - The Value of Philosophy
  - Russel The Problems of Philosophy (Selection)
  - Midgley Philosophical Plumbing (Selection)

### **BOOKS RECOMMENDED**

1. Abel Donald C., Stumpf Samuel Enoch, 2002. Elements of Philosophy: An Introduction, 4<sup>th</sup> Ed. McGraw Hill.
2. Scruton Roger, 2001. A short History of Modern Philosophy, 2<sup>nd</sup> ed. Routledge.

# MANAGEMENT COURSES

## ENTREPRENEURSHIP

### Course Objective:

Entrepreneurship is an important component in the process of economic development. The purpose of this course is to analyse the theories of entrepreneurship and to go for case studies of successful entrepreneurs.

### Course Contents:

**Introduction:** The concept of entrepreneurship, The economist view of entrepreneurship, The sociologist view, Behavioural approach, Entrepreneurship and Management

**The Practice of Entrepreneurship:** The process of entrepreneurship, Entrepreneurial Management, The entrepreneurial business, Entrepreneurship in service institutions, The new venture

**Entrepreneurship and Innovation:** The innovation concepts, Importance of innovation for entrepreneurship, Sources of innovative opportunities, The innovation process, Risks involved in innovation

**Developing Entrepreneur:** Entrepreneurial profile, Trait approach to understanding entrepreneurship, Factors influencing entrepreneurship, The environment, Socio cultural factors, Support systems

**Entrepreneurship Organization:** Team work, Networking organization, Motivation and compensation, Value system

**Entrepreneurship and SMES:** Defining SMEs, Scope of SMEs, Entrepreneurial, managers of SME, Financial and marketing problems of SMEs

**Entrepreneurial Marketing:** Framework for developing entrepreneurial marketing, Devising entrepreneurial marketing plan, Entrepreneurial marketing strategies, Product quality and design

**Entrepreneurship and Economic Development:** Role of entrepreneur in the economic development generation of services, Employment creation and training, Ideas, knowledge and skill development, The Japanese experience

### ***Case Studies of Successful Entrepreneurs***

### Text Books:

- Paul Burns and Jim Dew Hurst: Small Business and Entrepreneurship
- P.N. Singh: Entrepreneurship foOr Economic Growth
- Peter F. Drucker: Innovation and Entrepreneurship Peter F. Drucker
- John B. Miner: Entrepreneurial Success

# **PRINCIPLES OF MANAGEMENT**

## **Course Objectives:**

This is a rudimentary course for the students of business administration. The focus of attention will be given to learning fundamental principles of management and of managing people and organization in a historical as well as contemporary world. Students are expected to develop analytical and conceptual framework of how people are managed in small, medium and large public and private national and international organizations.

## **Course Contents:**

- Introduction, overview and scope of discipline
- The evolution and emergence of management thought
- Management functions
- Planning concepts, objectives, strategies and policies
- Decision making
- Organizing; departmentalization, line/staff authority, commitments and group decision making
- Staffing: principles of selection, performance, career planning
- Leading: Motivation, leadership, communication
- Controlling: the system and process and techniques of controlling
- Management and Society: future perspective

## **Text Books:**

- Stephen P. Robins, Mary Coulter: Management
- H. Koontz Odonnell and H. Weihrich: Management
- Mc Farland: Management: Foundation and Practice
- Robert M. Fulmer: The New Management.