GUIDELINE FOR PREPARING STANDARD CURRICULUM OF B.SC. IN MECHANICAL ENGINEERING

SUBMITTED BY

STANDARD SYLLABUS GUIDELINE MAKING COMMITTEE

1 INTRODUCTION

An engineering program must be carefully crafted to prepare engineering students for immediate entry into the workplace or to pursue advanced graduate study. Much of our youth future success depends on the quality of the education they receive. Therefore, the demands for quality standards in higher education are increasing. To ensure that an academic program is meeting certain standards necessary to produce graduates who are ready to enter their professions, UGC has decided to prepare curriculum guidelines. Curriculum needs to be aligned with national and international professional association guidelines and also to be accredited by reputable standards. For example, engineering curricula of universities in the USA are prepared meeting criteria set by the Accreditation Board for Engineering and Technology (ABET). UGC has prepared curriculum design guidelines meeting international standards.

Department offering a program on BS in Mechanical Engineering should have Educational Objectives based on the mission of the department and the perceived needs of the stakeholders. The mission statement should have a preamble followed by declarations of four interconnected commitments: to students, to faculty, to alumni, and to the industries. The program must have documented student outcomes. The attainment of these outcomes prepares graduates to enter the professional practice of engineering. The curriculum must support the attainment of the student outcomes and must include (ABET) required features:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program. Program outcomes must foster attainment of program educational objectives. There must be an assessment and evaluation process that periodically documents and demonstrates the degree to which the program outcomes are attained.

To prepare students to meet their career objectives, the mechanical engineering curriculum is suggested to be composed of three stages of education. During the first two years, emphasis should be placed upon establishing competence in mathematics, basic sciences, engineering sciences, and fundamental mechanical topics.

The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component should include:

a) One year of a combination of mathematics and basic sciences (some with experimental experience) appropriate to the discipline. The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex mechanical devices, knowledge related to the relevant software, and system components, as appropriate to program objectives.

b) One and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

c) A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives. Students take minimum five courses from language, social science and humanities. In general (i) one must be a first year course in English literature and Composition (i) two or three courses from the list of social science courses, and (ii) one or two course from the list of approved humanities courses.

2 CATEGORIES OF COURSES

2.1 LANGUAGE AND GENERAL EDUCATION (≈15-18% OF TOTAL CREDIT-HOURS)

A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives. Students should take minimum six courses from the Language and General Education.

2.1.1 LANGUAGES

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
English	Composition, writing and Communication	1	3	English course should be accompanied with reading and listening lab
Bengali**	Functional Bengali Language	1	2	

**For foreign students, Benglai/Other humanities subject may be taught

2.1.2 GENERAL EDUCATION

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
Social Science	Sociology, Government, Political Science, Environment and Society, Introduction to Human Development, Social Inequality and Planning, etc.	3	6	Compulsory: A 2 Crhrs courses on: Environmental Protection ; Bangladesh Studies; Ethics and Professionalism
Arts and Humanities	Bangladesh Studies, International Relations, Engineering Ethics and Professionalism, Public Communication, etc.			
Business	Engineering Economics, Financial and Managerial Accounting, Business Communications, Industrial and Operational	1	3	

	Management , Technology Entrepreneurship, Business Management, etc.			

2.2 BASIC SCIENCES AND MATHEMATICS (≈25 - 30% OF TOTAL CREDIT HOURS)

2.2.1 BASIC SCIENCES

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
Physics	Mechanics, Waves and Oscillations, Optics, Structure of Matters, Electricity and Magnetism, Modern and Quantum Physics, etc.	2T + 1L	7	T- Theory L- Laboratory Biology course may be included if Biomedical Engineering is considered as a focus area
Chemistry	Inorganic, Quantitate Analysis, Chemistry of Engineering Materials, Thermo chemistry, etc.	1T + 1L	4	

2.2.2 MATHEMATICS

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
Mathematics	Differential and Integral Calculus, Probability and Statistics, Complex Variables, Vector Analysis, Differential Equations, Linear Algebra, Solid Geometry, Matrices, Laplace Transform, Numerical Analysis, Engineering Mathematics, etc.	4	12	

2.3 OTHER ENGINEERING (≈10-15% OF THE TOTAL CREDIT HOURS)

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
a) Computer Science and Engineering b) Electrical Engineering c) Industrial Production Engineering d) Chemical Engineering e) Material Engineering	Computer programming, Electrical and Electronics Technology, Electric Machines, Digital Electronics, Materials Science, Production Process, Machine Tools, Manufacturing Process, Quality control, etc.	4	12	

2.4 PROGRAM COURSES (≈50-60%)

2.4.1 CORE

Type	Description	No of Courses (recommended)	Credit Hours (recommended)	Remarks
Engineering Drawing	General Engineering Drawing, Drawing of Mechanical Engineering Element/System	1 L	1.5	
Thermal Sciences	Engineering Thermodynamics, Heat Transfer, Internal Combustion Engines, Power Plant Engineering, Heat Transfer Equipment Design, Thermo-fluid System Design, etc.	4 T+ 3L	15	

Applied Mechanics	Engineering Mechanics, Mechanics of Solids, Mechanics of Machinery, Machine Design, Mechanical Vibration, etc.	4 T + 1L	13	
Fluids	Fluid Mechanics, Fluid System Design, Fluid Machinery, etc.	2T + 2 L	8	
Instrumentation and Control	Instrumentation and Measurement, Elector-Mechanical System Design, Mechatronics, etc.	1T + 1L	4	
Engineering practices	Machine Shop Practices	1L	1	
Project/Thesis	Design/Research on Mechanical System/ Element/ Equipment	1	6	
Industrial Attachment	Industrial Training	1	0.5	

2.4.2 TECHNICAL ELECTIVES (≈10-15%)

Type	Areas*	No of Courses (recommended)	Credit Hours (recommended)	Remarks
Technical Electives	a. Building Mechanical System b. Energy c. Fluids Engineering d. Robotics e. Control Engineering f. Engineering Materials g. Biomedical Engineering h. Nano Technology i. Automobile Engineering j. Petroleum Engineering k. Nuclear Engineering l. Textile Technology	4	12	

* University may consider areas outside those mentioned.

3 MINIMUM CREDIT HOUR REQUIREMENT FOR AWARDING DEGREE

Program	Minimum Credit hour requirement for degree	
	Bi-semester (15-16 weeks excluding final exam week)	Remarks
B. Sc in ME	120	For 14 weeks classes of 50 minutes semester system, minimum credit hours = 154

The credit hour for bi-semester system considered in the calculation is used for 15 week classes excluding final examination week (details in section 3). But public universities in Bangladesh adopt bi-semester system of 14 week class of 50 minutes duration which is less than 15 weeks. Total credit hours (minimum) required for bi-semester system in public universities are calculated considering a linear relation with no. of weekly classes. Minimum Credit hours required for 14 week class of 50 minutes duration are equal to 154 credit hours.

4 CREDIT HOUR

A "CREDIT HOUR" is the unit of measuring educational CREDIT, usually based on the number of classroom hours per week throughout a semester of a bi-semester system. Students are awarded credit for classes on the basis of the Carnegie unit: (http://www.lasc.edu/students/Credit%20Hour%20Definition%20for%20LASC.pdf)

Lecture Classes

One semester credit hour will be awarded for a minimum of 750 minutes of formalized instruction that typically requires students to work at out-of-class assignments an average of twice the amount of time as the amount of formalized instruction (1,500 minutes). It is acknowledged that formalized instruction may take place in a variety of modes.

Laboratory Classes

For a laboratory class, the hours per week are considered to be all in a class with no outside assignments. Thus, one unit is two and a half hours (150 minutes) per week of laboratory time, which amounts to 2250 minutes in 15 weeks.

4. University Grading Standards

Grade	Quality Points	Quality of Performance
A	4.0	Excellent
B	3.0	Good
C	2.0	Satisfactory
D	1.0	Passing
F	0.0	Failure

An institution may adopt a further division of letter grade voice A+, A-, B+, B-, C+, C-, D+, etc. and select percentage marks against letter grade. The institution will determine minimum average cumulative grade point (CGPA) ($\geq$ C) required for awarding the degree.

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