MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

(MIST)

SYLLABUS OF

MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING / M. ENGINEERING IN BIOMEDICAL ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING (BME)

JULY 2015

(Revised on July 2015, Applicable for M.Sc / M. Engg. in BME)

THE COMMITTEE OF COURSES

The committee of courses for the introduction of Master Degree Program at BME Dept, MIST published vide BUP letter no. 23.01.902.858.26.786.04 dated 02 July 2015. The undersigned committee has been proposed to work out the detail course outline for the Master Degree Program for BME Dept.

President	: Col Abu Zafor Mohammad Salahuddin Dean, Faculty of NSBME, MIST
Members	: Prof. Dr. K. Siddique-e-Robbani, BPT Dept, DU
	: Prof. Dr. Aynal Haque, EEE Dept, BUET
	: Maj Mohammad Akhter Hasib Dwan, AMC, CMH, Dhaka
	: Prof. Dr. Abdus Sattar Mollah, NSE Dept, MIST
	: Major Dr. Md. Ashrafuzzaman, Head, BME Dept, MIST
Member Secretary	: Major Dr. Md. Maruf Hasan BME Dept. MIST

CHAPTER 1

Master's in Biomedical Engineering (BME)
DEPARTMENT OF BIOMEDICAL ENGINEERING
MIST, Mirpur Cantonment, Dhaka – 1216

1. Introduction

Biomedical Engineering is a broad, interdisciplinary field that deals with the problems in biology, medicine, and biotechnology. These problems include the design and analysis of physiologic measuring and diagnostic systems as well as quantitative analysis and experimentation directed toward obtaining a clearer understanding of the human body's normal and abnormal functions. The true integration of the life sciences and engineering is essential in educating a substantial percentage of the next generation of biomedical engineers in order to benefit from the biological revolution and its applications to medicine.

The Master's programme in Biomedical engineering offers students deep knowledge and functional skills in most fields of relevance for Biomedical engineering. The mission of the Biomedical Engineering Department is to pursue excellence in biomedical engineering education, research, and innovation; creating and imparting knowledge for improving society, human health, and health care. After graduation, students will be the proud member of this noble society.

1.1 Program Outline

The 2.0 year Master's programme includes three terms of course activities and two terms of degree project work, adding up to a total of 36 credits. Courses will include lectures, classroom exercises, laboratory exercises, study visits and project work. The 36 credit curriculum ensures that students looking for a career in the healthcare sector gain fundamental technology, technology development and commercialization skills important to biomedical engineers. Students in the M.Eng degree program develop deep technical skills through advanced biomedical engineering courses and are exposed to issues related to product development, intellectual property and commercialization. Through the thesis work students can get engaged with the clinical community to identify and develop novel engineering solutions to medical problems.

1.2 Career Prospects

Biomedical engineers apply engineering principles and materials technology to healthcare. This can include researching, designing and developing medical products, such as joint replacements or robotic surgical instruments, designing or modifying equipment for clients with special needs in a rehabilitation setting, or managing the use of clinical equipment in hospitals and the community. The scope for biomedical engineers is growing rapidly. These job opportunities are most commonly found in fields such as cellular, tissue, genetic, clinical, and rehabilitation engineering. Additionally, there are opportunities within the fields of bioinstrumentation, biomaterials, biomechanics, drug design and delivery, medical imaging, orthopedic surgery, pharmaceuticals, and systems physiology.

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CHAPTER 2

2 DETAIL OUTLINE OF POSTGRADUATE COURSES OFFERED BY DEPARTMENT OF BME, MIST

2.1 The courses offered by the Department for Masters Program are generally divided in the following divisions.

a. Thesis / Project,
b. General Compulsory Courses, and
c. Optional Courses.

2.2 The following courses are offered by the Department for Master's Program. Each term only some of the courses (typically 4-6) are offered from the different divisions.

Course Name	**Course Code**	**Credit**
Thesis (M. Sc. Engg.)	BME 7500	18.0
Project (M. Engg.)	BME 7500	6.0
Compulsory Courses		
Principles of Biomedical Instrumentation and Devices	BME 7503	3.0
Biomedical Engineering Practice and Innovation	BME 7505	3.0
Cell and Tissue Engineering	BME 7507	3.0
Optional Courses (Any 3 courses for M.Sc. & 7 courses for M.Engg.)		
Advanced Signal Processing for Biomedical Engineering	BME 7509	3.0
Biomaterials & Nanotechnology for Biomedical Application	BME 7511	
Biomedical Prosthetics: Science, Technology & Applications	BME 7513	3.0
Bioprocess & System Bioengineering	BME 7515	3.0
Molecular Biology & Regenerative Medicine	BME 7517	3.0
Drug design & Target Delivery Systems	BME 7519	3.0
Fluid & Solid Mechanics for Biomedical Engineering	BME 7521	3.0
Hospital planning, design & Management	BME 7523	3.0
Medical Implants & Biomechanics	BME 7525	3.0
Modeling, Simulation & Bioinformatics	BME 7527	3.0
Nuclear Physics in Biomedical Applications	BME 7529	3.0
Numerical Modeling of Artificial Brace & Limbs	BME 7531	3.0
Physiology and Anatomy for Biomedical Engineering	BME 7533	3.0
Principles of Medical Imaging & Processing	BME 7535	3.0
Principles of Neuroscience & Neuroengineering	BME 7537	3.0
Seminar	BME 7502	Non credit

2.3 Syllabuses of the Courses

The details of the courses are as follows:

2.3.1 Compulsory Courses

BME 7500 Thesis/Project

The students will complete the 2 years Master's Programme with 6 credits thesis or 6 credits degree project to be conducted in two parts during the last two semesters. A student must complete at least 12 credits of general theory courses before starting the thesis or degree project. The thesis or degree project may be performed at the different nuclear institutes of this country. With the growing need for competent employees in the nuclear industry, there are many opportunities to perform this project at a company in the industry.

Research may be undertaken in Biomedical Engineering or in a related field. A thesis supervisor must be a member of the faculty of the Biomedical Engineering Department of MIST. A thesis can be primarily theoretical or experimental, or can combine both approaches. A Master's thesis is normally completed within 12 months. Students should use this as a guide in planning their research schedule. No student will be allowed to register for more than two semesters of Master's thesis work without petitioning for and receiving the express consent of the Departmental Committee on Graduate Students. Careful initial planning is essential for successful completion of a research project. Each thesis student is required, therefore, to turn in one copy of a brief thesis prospectus to the Department Academic Office by the end of the eighth week of the first term of Master's thesis registration. The prospectus should be a clear and well-organized preliminary report. It should contain (1) an introduction to the subject, giving a brief general statement of the field of interest and a concrete statement of the limited area of work which it is intended to undertake; (2) a review of relevant background information; (3) the proposed method of solution; (4) a tentative time schedule for completion of the work; (5) the name of the faculty member who will act as thesis advisor, and co-supervisor to be selected by the student with the concurrence of the advisor; (6) signatures of thesis advisor and co-supervisor to indicate approval of the proposed research project. It is the responsibility of the student to maintain a rate of progress that will insure completion of the thesis within the two semesters allowed. The thesis supervisor may require periodic, written reports on the progress of the thesis. Students should be prepared to submit these if requested.

Each graduate student preparing a thesis is responsible for compliance with Institute and Department instructions regarding thesis preparation. Three copies of the thesis in final printed form and one electronic copy, in PDF form, on CD are to be submitted to the Department Academic Office. Original signatures of the thesis supervisor and co-supervisor (if any) must appear on the thesis cover page.

The students will perform their research work in the laboratories of Biomedical Engineering Department of MIST or related facilities in other academic and research institutes in home & abroad with the guidance of thesis / project supervisor.

BME 7503 Principles of Biomedical Instrumentation and Devices

Basic and advanced principles, concepts, and operations of Biomedical sensors and devices. The origin and nature of measurable physiological signals, including chemical, electrochemical, optical, and electromagnetic signals. The principles and devices of measurements, including a variety of electrodes and sensors. This will be followed by a rigorous presentation of the design of appropriate electronic instrumentation. Therapeutic instrumentation such as pacemakers, defibrillators, and prosthetic devices will be reviewed. Frontiers of cellular and molecular instrumentation and the use of micro- and nanotechnology in the biotechnology fields. Hands-on experience with electronic components, sensors, biopotential measurements, and testing of therapeutic instrumentation. The Syllabus of this course will be followed as;

- A review of basics
- Sensor Principles
- Sensors: Signals
- Interface Sensor Circuits
- Sensors: Classification & Measurements
- Application: Cardio-electrophysiology
- Application: Neuroelectrophysiology
- Chemical Sensors; Imaging
- Medical Devices - Noninvasive/Noncritical
- Medical Devices - Invasive/Critical
- Prognostics; Diagnostics; Therapeutics
- Prosthetics & Rehab Engineering
- Bench to Bedside: Translational Applications of Sesnors/Devices
- Medical Devices: Regulatory & Ethical Considerations

Text & Reference Books:

1. The Biomedical Engineering Handbook, *Fourth Edition*, Joseph D. Bronzino
2. Medical Instruments and Devices: Principles and Practices, *1st Edition*, Steven Schreiner, Joseph D. Bronzino, Donald R. Peterson
3. Medical Instrument Design and Development: From Requirements to Market Placements, *1st Edition*, Claudio Becchetti, Alessandro Neri
4. Noninvasive Instrumentation and Measurement in Medical Diagnosis (Biomedical Engineering), *1st Edition*, Robert B. Northrop
5. Measurement and Data Analysis for Engineering and Science, *2nd Edition*, Patrick F. Dunn

BME 7505 Biomedical Engineering Practice and Innovation

This course will cover experimental and design work primarily physiology, cell and tissue engineering, and biomedical instrumentation. Additionally, this course will emphasize the business-end of biomedical engineering innovation including identification of engineered-needs and FDA regulation. The Syllabus of this course will be followed as;

- Skeletal Muscle Function & EMGs
- Cardiac Mechanics & ECGs
- Biointerfacing
- Microfabrication
- Tissue Engineering
- Ultrasound Imaging
- Cardiac Catheterization
- Biophotonics

Text & Reference Books:

1. Medical Device Design: Innovation from concept to market, *1st Edition*, Peter J Ogrodnik
2. Advanced Manufacturing Technology for Medical Applications: Reverse Engineering, Software Conversion and Rapid Prototyping, *1st Edition*, Ian Gibson
3. New Technologies in Health Care: Challenge, Change and Innovation (Health Technology and Society), *1st Edition*, Andrew Webster
4. From X-rays to DNA: How Engineering Drives Biology, W. David Lee, Jeffrey Drazen, Phillip A. Sharp, Robert S. Langer
5. Microfabrication in Tissue Engineering and Bioartificial Organs (Microsystems), *1st Edition*, Sangeeta N. Bhatia
6. Understanding Biophotonics: Fundamentals, Advances, and Applications, *1st Edition*, Kevin Tsia
7. Bio-Interfacing Devices (BID), S. M. Namal Arosha Senanayake

BME 7507 Cell and Tissue Engineering

This course will cover fundamental biological processes and medical engineering tools essential to regenerative medicine both at the single cell and whole organism level. Topics include: stem cell engineering, cell-matrix & cell-scaffold interactions, cell-cell interactions & tissue morphogenesis, wound healing and in vitro organogenesis. The Syllabus of this course will be followed as;

- The Challenge: Creating a Living Tissue
- Quantum Information Processing & Genetic Engineering
- Cellular Dynamics
- Tissue Organization & Dynamics
- Morphogenesis
- Cell Numbers & Growth
- Cell Adhesion & Migration
- Cell & Tissue Mechanics
- Cell Trafficking & amp;amp; Molecular Transport
- Cell and Molecule Delivery & Biomaterials
- Host Integration
- Stem Cells
- Engineered Bone, Skin & Liver
- Translating tissue engineered products to the patients

Text & Reference Books:

1. Cell and Tissue Engineering, *2012th Edition*, Bojana Obradovic
2. Introduction to Tissue Engineering: Applications and Challenges (IEEE Press Series on Biomedical Engineering), *1st Edition*, Ravi Birla
3. Tissue Engineering in Regenerative Medicine (Stem Cell Biology and Regenerative Medicine), *2011th Edition*, Harold S. Bernstein
4. Cardiac Tissue Engineering: Principles, Materials, and Applications (Synthesis Lectures on Tissue Engineering), *1st Edition*, Emil Ruvinov, Yulia Sapir, Smadar Cohen
5. Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues, *1st Edition*, W. Mark Saltzman
6. Stem Cells and Cell Therapy (Cell Engineering), *2014th Edition*, Mohamed Al-Rubeai (Editor), Mariam Naciri
7. Techniques in Genetic Engineering, *1st Edition*, Isil Aksan Kurnaz

BME 7509 Advanced Signal Processing for Biomedical Engineering

This course will focus on Signal Processing, including linear and non-linear analysis of primary electro-physiological signals. Topics include: more traditional, auto-regressive moving average analysis, spectral analysis, singular value decomposition as well as advanced methods such as entropy computation, dimensionality estimation, state-space reconstruction, recurrence time analysis, parameter estimation etc. A good knowledge of basic math, differential calculus, linear algebra and MATLAB programming is expected. All MIST BME students will have a free access to licensed MATLAB. The Syllabus of this course will be followed as;

- Physiological Signals - Basics
- Linear Systems Theory
- Spectral Analysis
- Time-Frequency Domain Methods
- Nonlinearity - Phase Space Methods, Instability
- Phase Space Reconstruction
- Dimensionality Analysis
- Noise Reduction
- Information Entropy
- Complexity & Biomedical Signals
- Three sides of a coin! Modeling, Estimation & Signal Processing
- Applications - Signals from the heart
- Applications - 'mechanical' signals
- Applications - Brain Signals

Text & Reference Books:

1. MATLAB: An Introduction with Applications, *5th Edition*, Amos Gilat
2. Advanced Fuzzy Logic Technologies in Industrial Applications (Advances in Industrial Control), *2006th Edition*, Ying Bai, Hanqi Zhuang, Dali Wang
3. Advanced Methods of Biomedical Signal Processing, *1st Edition*, Sergio Cerutti, Carlo Marchesi
4. Advanced Signal Processing on Brain Event-Related Potentials: Filtering ERPs in Time, Frequency and Space Domains Sequentially and Simultaneously, *1st Edition*, Fengyu Cong, Tapani Ristaniemi, Heikki Lyytinen
5. Lung Sounds: An Advanced Signal Processing Perspective (Synthesis Lectures on Biomedical Engineering), *1st Edition*, Leontios Hadjileontiadis
6. Autonomic Nervous System Dynamics for Mood and Emotional-State Recognition: Significant Advances in Data Acquisition, Signal Processing and Classification (Series in BioEngineering), *2014th Edition*, Gaetano Valenza, Enzo Pasquale Scilingo

7. Signal and Image Analysis for Biomedical and Life Sciences (Advances in Experimental Medicine and Biology), *2015th Edition*, Changming Sun, Tomasz Bednarz, Tuan D. Pham, Pascal Vallotton, Dadong Wang

BME 7511 Biomaterials & Nanotechnology for Biomedical Application

The fundamentals of the synthesis, properties, and biocompatibility of metallic, ceramic, polymeric, and biological materials that come in contact with tissue and biological fluids. Emphasis is placed on using biomaterials for both hard and soft tissue replacement, organ replacement, coatings and adhesives, dental implants, and drug delivery systems. New trends in biomaterials, such as electrically conductive polymers, piezoelectric biomaterials, and sol-gel processing will be discussed. The Syllabus of this course will be followed as;

- Metallic Implant Materials
- Ceramic Implant Materials
- Hard and Soft Tissue Replacement
- Introduction to Polymer Science
- Polymer Implant Materials
- Polymers for Biomaterials
- Composites for Biomaterials
- Biological Materials
- Tissue Response to Implants
- Tissue Engineering

Text & Reference Books:

1. Biomedical Engineering & Design Handbook, Volumes I and II, *2nd Edition*, Myer Kutz
2. Biomimetics - Materials, Structures and Processes: Examples, Ideas and Case Studies (Biological and Medical Physics, Biomedical Engineering), *2011th Edition*, Petra gruber, Dietmar Bruckner, Christian Hellmich, Heinz-Bodo Schmiedmayer, Herbert Stachelberger, Ille C. Gebeshuber
3. Carbon Nanotubes for Biomedical Applications (Carbon Nanostructures), *2011th Edition*, Rüdiger Klingeler, Robert B. Sim
4. Modified Fibers with Medical and Specialty Applications, *2006th Edition*, Vincent Edwards (Editor), Gisela Buschle-Diller (Editor), Steve Goheen
5. Nanostructured Materials and Coatings for Biomedical and Sensor Applications (Nato Science Series II:), Yury G. Gogotsi (Editor), Irina V. Uvarova
6. Nanodiamonds: Applications in Biology and Nanoscale Medicine, *2010th Edition*, Dean Ho
7. Medicinal Chemistry and Pharmacological Potential of Fullerenes and Carbon Nanotubes (Carbon Materials: Chemistry and Physics), 2008th *Edition*, Franco Cataldo (Editor), Tatiana da Ros

8. Nanomaterials in Tissue Engineering: Fabrication and Applications (Woodhead Publishing Series in Biomaterials), *1st Edition*, A K Gaharwar (Editor), S Sant (Editor), M J Hancock (Editor), S A Hacking

BME 7513 Biomedical Prosthetics: Science, Technology & Applications

Prosthetics and orthotics is the clinical technology related to the provision of prostheses (artificial limbs) to people with amputations, and orthoses (supportive devices), to people with musculoskeletal weakness or neurological disorders. Students will acquire theoretical knowledge of anatomy, physiology, biomechanics, and prosthetic and orthotic prescription, design and fabrication, enhanced by strong practical skills in research methodology, clinical assessment, and the application of prosthetic and orthotic techniques.

Text & Reference Books:

1. Advances for Prosthetic Technology: From Historical Perspective to Current Status to Future Application, *1st Edition*, *2016 Edition*, Robert LeMoyne
2. Biodegradable Metals: From Concept to Applications (SpringerBriefs in Materials), *2012th Edition*, Hendra Hermawan
3. Implantable Neural Prostheses 1: Devices and Applications (Biological and Medical Physics, Biomedical Engineering), *2009th Edition*, David Zhou (Editor), Elias Greenbaum
4. Implantable Neural Prostheses 2: Techniques and Engineering Approaches (Biological and Medical Physics, Biomedical Engineering), *2010th Edition*, David Zhou (Editor), Elias Greenbaum
5. Powered Upper Limb Prostheses: Control, Implementation and Clinical Application, 1st Edition, Ashok Muzumdar
6. Titanium in Medicine: Material Science, Surface Science, Engineering, Biological Responses and Medical Applications (Engineering Materials), *1st Edition*, D.M. Brunette (Editor), P. Tengvall (Editor), Marcus Textor (Editor), P. Thomsen
7. Application of the Finite Element Method in Implant Dentistry (Advanced Topics in Science and Technology in China)**,** *2008th Edition***,** Jianping Geng (Editor), Weiqi Yan (Editor), Wei Xu

BME 7515 Bioprocess & System Bioengineering

The field of Bioengineering encompasses a broad range of topics, all of which focus on the interface between biology and engineering. Bioengineers use engineering skills to design devices or develop methods that interface with biological systems. Bioengineering for the design of artificial organs, development of new methods to detect or treat cancer, production of devices to measure biological agents, or formulation of materials for the controlled release of drugs. Bioengineering majors interested in production of vaccines, enzymes, biofuels, biopharmaceuticals and biopolymers may take advantage of a Bioprocess Engineering Concentration. Biological and bioprocess engineering are required to design novel manufacturing approaches for new drugs and related products such as proteins, cell therapies, tissue engineering and gene therapeutics. The fundamental discovery of DNA, the most basic unit of life, the tools to precisely manipulate this cellular component arrived. This led to the emergence of the most recent branch of bioengineering - Biological and Systems

Bioprocessing (BSB). Bioengineering in this sense, has the ability to impact on diverse issues mankind faces today, such as producing novel medicines, super-efficient food crops, carbon neutral energy from photosynthetic organisms, pollution degrading bacteria, biological computer chips and a wide array of consumer products and industrial processes.

Text & Reference Books:

1. Bioprocess Engineering: An introductory Engineering and Life Science Approach, *1st Edition*, Kim Gail Clarke
2. Bioprocess Engineering: Systems, Equipment and Facilities, *1st Edition*, Bjorn K. Lydersen (Editor), Nancy A. D'Elia (Editor), Kim L. Nelson
3. Systems Biology: Properties of Reconstructed Networks, *1st Edition*, Bernhard Ø. Palsson
4. Computational Intelligence Techniques for Bioprocess Modelling, Supervision and Control (Studies in Computational Intelligence), *2009th Edition*, Maria Carmo Nicoletti
5. Biosystems Engineering II: Linking Cellular Networks and Bioprocesses (Advances in Biochemical Engineering/Biotechnology), 2010th Edition, Christoph Wittmann, Rainer Krull
6. Dynamics of Complex Interconnected Systems: Networks and Bioprocesses (Nato Science Series II:), 2006th Edition, Arne T. Skjeltorp (Editor), Alexander V. Belushkin
7. Metabolomics: Methods and Protocols (Methods in Molecular Biology), 2007th Edition, Wolfram Weckwerth

BME 7517 Molecular Biology & Regenerative Medicine

Regenerative medicine involves the repair and regeneration of tissues for therapeutic purposes, such as replacing bone marrow in leukemia, cartilage in osteoarthritis or cells of the heart after a heart attack. Tissue regeneration has been of interest throughout history. Tissue is normally generated during fetal development by the differentiation of embryonic stem cells or during postnatal life by a similar differentiation of adult stem cells. Regenerative medicine tries to mimic these processes.

In this course, the student will explore basic mechanisms of how cells differentiate into specific tissues in response to a variety of biologic signaling molecules. They will learn the use of such factors for in vitro tissue production. For example, bone morphogenetic proteins can be used in vitro to drive the differentiation of adult stem cells towards bone and heart. They will also study the cellular mechanisms involved in the cloning of animals and artificial organ production, such as the in vitro formation of beating heart cells. Students will also consider the molecular bases of cellular and functional changes of different organs that occur in disease and treatments that cause tissue remodeling to correct these changes. They will learn how studies of the developmental, cellular and molecular biology of regeneration have led to the discovery of new drugs. They will visit the various hospitals and pharmaceuticals to see the patients with regenerated tissues and the drug production facility to see how drugs are produced for human use.

Text & Reference Books:

1. Regenerative Biology and Medicine, *2nd Edition*, David L. Stocum
2. Regenerating the Heart: Stem Cells and the Cardiovascular System (Stem Cell Biology and Regenerative Medicine), *2011th Edition*, Ira S. Cohen, Glenn R. Gaudette
3. Mesenchymal Stromal Cells: Biology and Clinical Applications (Stem Cell Biology and Regenerative Medicine), 2013th Edition, Peiman Hematti, Armand Keating
4. Umbilical Cord Blood Banking and Transplantation (Stem Cell Biology and Regenerative Medicine), 2014th Edition, Karen Ballen
5. Stem Cells: An Insider's Guide, *1st Edition*, Paul Knoepfler
6. Stem Cells in the Lung: Development, Repair and Regeneration (Stem Cell Biology and Regenerative Medicine), 2015th Edition, Ivan Bertoncello
7. The Immunological Barriers to Regenerative Medicine (Stem Cell Biology and Regenerative Medicine), *2013th Edition*, Paul J. Fairchild

BME 7519 Drug design & Target Delivery Systems

This course is primarily designed to prepare students for an academic or industrial career in pharmaceutics or drug delivery. Qualified postgraduates are in significant demand, due to the continued development of highly complex and sensitive drug molecules. The course is based with several research modules and a specific research project. These modules cover the biology of disease states, designing drugs and delivery systems, research methods and exploiting your research. The Syllabus of this course will be followed as;

- Drug Discovery
- Chemotherapy & Selective Toxicity
- Drug Dosage Form & Design
- Principles of Product Analysis and Validation
- Drug Delivery and Targeting
- Research Methods 1: Professional Development
- Research Methods 2: Communication Skills
- Research Project

Text & Reference Books:

1. Computational Drug Design: A Guide for Computational and Medicinal Chemists, *1st Edition*, D. C. Young
2. Computer-Aided Drug Design and Delivery Systems, *1st Edition*, Ahindra Nag
3. Bioinspired and Biomimetic Polymer Systems for Drug and Gene Delivery, 1st Edition, Zhongwei Gu
4. Target Validation in Drug Discovery, *1st Edition*, Brian W. Metcalf (Editor), Susan Dillon
5. Diagnostic and Prognostic Biomarkers and Therapeutic Targets in Melanoma (Current Clinical Pathology), 2012th Edition, Michael J. Murphy

6. Design and Development of Colon Targeted Drug delivery System: A Novel Approach to target Colon, 2012th Edition, Mukesh R. Patel (Author), N. M. Patel (Author), Kanu R. Patel
7. Design of Controlled Release Drug Delivery Systems (McGraw-Hill Chemical Engineering), *1st Edition*, Xiaoling Li

BME 7521 Fluid & Solid Mechanics for Biomedical Engineering

The goal of this class is to learn the relation between the mechanics and physiology (biology) of tissues and cells. This relation is demonstrated by introducing general models of solid and fluid mechanics and applying them to the cardiovascular system and bones. In particular, the arterial wall and endothelial cell mechanics as well as bone anisotropic properties and remodeling are discussed. The course also shows how theoretical models are used to interpret experiments and how experimental data are used to estimate important parameters (constants) of the models. Experiments with biaxial stretching, micropipette aspiration, and atomic force microscopy commonly used to probe the mechanical properties of tissues and cells are discussed in detail. The models include anisotropic linear elasticity, nonlinear elasticity, viscoelasticity, and Newtonian (non-Newtonian) fluid dynamics.

Text & Reference Books:

1. An Introduction to Biomechanics: Solids and Fluids, Analysis and Design, 2nd Edition, 2015 Edition, Jay D. Humphrey (Author), Sherry L. O'Rourke
2. Complex Fluids in Biological Systems: Experiment, Theory, and Computation (Biological and Medical Physics, Biomedical Engineering), 2015th Edition, Saverio Spagnolie
3. Fluid-Structure Interaction and Biomedical Applications (Advances in Mathematical Fluid Mechanics), 2014 Edition, Tomas Bodnar (Editor), Giovanni P. Galdi (Editor), Sarka Necasova
4. The Application of Biofluid Mechanics: Boundary Effects on Phoretic Motions of Colloidal Spheres (SpringerBriefs in Physics), 2014th Edition, Po-Yuan Chen
5. Porous and Complex Flow Structures in Modern Technologies, *2004th Edition*, Adrian Bejan, Ibrahim Dincer, Sylvie Lorente, Antonio Miguel, Heitor Reis
6. Biomedical Applications of Mesoporous Ceramics: Drug Delivery, Smart Materials and Bone Tissue Engineering, *1st Edition*, María Vallet-Regí (Author), Miguel Manzano García (Author), Montserrat Colilla

BME 7523 Hospital planning, design & Management

This course focuses on leadership and management issues in health care organizations while providing students with a practice setting to examine and develop their own management skills. Each team acts as a consultant to a local healthcare organization which has submitted a project proposal to the course. Students will assist in hospital planning and hospital design according to international standards and contemporary design parameters. The hospital designs and drawings are reviewed based on the departments, patient flow, adequateness for other services and management ease. The graduate teams define the issue and negotiate a contract with the client organization. By the end of the semester, teams present assessments and recommendations for action to their clients and share their experience with the class in a series of workshops and cross-team consultations. We will bring our vast experience to ensure that the design enhances the effectiveness and efficiency of the facility at optimal cost.

Text & Reference Books:

1. Hospitals: Planning, design, and management, G. D Kunders
2. Healthcare Facility Planning: Thinking Strategically (ACHE Management), *1st Edition*, Cynthia Hayward
3. Planning Medical Center Facilities for Education, Research and Public Service, George T. Harrell
4. Healing the Hospital Environment: Design, Management and Maintenance of Healthcare Premises, Liz Haggard, Sarah Hosking
5. Performance Improvement for Healthcare: Leading Change with Lean, Six Sigma, and Constraints Management, *1st Edition*, Bahadir Inozu, Dan Chauncey, Vickie Kamataris, Charles Mount, LLC NOVACES

BME 7525 Medical Implants & Biomechanics

The course is aimed at studying the mechanical and structural engineering of the musculoskeletal system alongside the analysis and design of orthopaedic solutions to musculoskeletal failure. This design course targets the solution of clinical problems by use of implants and other medical devices. Topics include the systematic use of cell-matrix control volumes; the role of stress analysis in the design process; anatomic fit, shape and size of implants; selection of biomaterials; instrumentation for surgical implantation procedures; preclinical testing for safety and efficacy, including risk/benefit ratio assessment evaluation of clinical performance and design of clinical trials. Student project materials are drawn from orthopedic devices, soft tissue implants, artificial organs, and dental implants. Biomechanical principles of fracture repair and joint reconstruction will also be taught.

Text and Reference Books:

1. Musculo-skeletal Biomechanics, Paul Brinckmann
2. Biomechanics of Joints, 2013 Edition, Shyam D.Ganvir, Shuvarna Ganvir , Amit V. Nagarale.
3. Fundamentals of Biomechanics, Duane Knudson
4. Biomechanics of Spine Stabilization (Book with CD-ROM), 1st Edition, Edward C. Benzel
5. Fundamentals of Orthopaedic Biomechanics, 1994th Edition, Albert H. Burstein (Author), Timothy M. Wright
6. Mechanics of Biomaterials: Fundamental Principles for Implant Design (Cambridge Texts in Biomedical Engineering), 1st Edition, Lisa A. Pruitt, Ayyana M. Chakravartula
7. Biomechanics and Biomaterials in Orthopedics, 2004th Edition, Dominique G. Poitout (Editor), Rainer Kotz
8. Planning and Reduction Technique in Fracture Surgery, 1989th Edition, Jeffrey Mast , Roland Jakob, Reinhold Ganz, J.P. Imken, H. Willenegger
9. Biomechanics of Dental Implants: Handbook for Researchers (Dental Science, Materials and Technology), Murat Chreli

BME 7527 Modeling, Simulation & Bioinformatics

Computer simulations are becoming increasingly important in understanding and predicting the behavior of a wide variety of biological systems, ranging from metastasis of cancer cells, to spread of disease in an epidemic, to management of natural resources such as fisheries and forests. In this course, students will learn to use a graphical programming language to simulate biological systems. Most of the classroom time will be spent working individually or in groups, first learning the language, and then programming simulation projects. Students will acquire a working knowledge of bioinformatics applications through hands-on use of software to ask and answer biological questions in such areas as genetic sequence and protein structure comparisons, phylogenetic tree analysis, and gene expression and biological pathway analysis. In addition, the course will provide students with an introduction to some of the theory underlying the software (for example, how alignments are made and scored). We will also discuss several papers on biological simulations from the primary scientific literature. In constructing and comparing their simulations, students will demonstrate for themselves how relatively simple behavioral rules followed by individual molecules, cells, or organisms can result in complex system behaviors. Recommended background: Students taking this course must have a solid background in a biological area they would like to simulate. Data from genome sequencing, large-scale expression analysis, and other high-throughput techniques provide bases for systems identification and analysis. Discussion of gene-metabolic network synthesis. This course will investigate computational techniques for discovering patterns in and across complex biological and biomedical sources including genomic and proteomic databases, clinical databases, digital libraries of scientific articles, and oncologies. Techniques covered will be drawn from several areas including sequence mining, statistical natural language processing and text mining, and data mining. This course will use interactive visualization to model and analyze biological information, structures, and processes. Topics will include the fundamental principles, concepts, and techniques of visualization (both scientific and information visualization) and how visualization can be used to study bioinformatics data at the genomic, cellular, molecular, organism, and population levels. Students will be expected to write small to moderate programs to experiment with different visual mappings and data types.

Text & Reference Books:

1. Biosimulation in Biomedical Research, Health Care and Drug Development, *2012th Edition*, Erik Mosekilde (Editor), Olga Sosnovtseva (Editor), Amin Rostami-Hodjegan
2. Modeling of Physiological Flows (MS&A), 2012th Edition, Davide Ambrosi, Alfio Quarteroni, Gianluigi Rozza
3. Computational Intelligence in Biomedicine and Bioinformatics: Current Trends and Applications (Studies in Computational Intelligence), 1st edition, Tomasz G. Smolinski, Mariofanna G. Milanova, Aboul-Ella Hassanien
4. Molecular Modeling of Proteins (Methods in Molecular Biology), *1st Edition*, Andreas Kukol
5. Modeling in Computational Biology and Biomedicine: A Multidisciplinary Endeavor, *2013th Edition*, Frédéric Cazals (Editor), Pierre Kornprobst (Editor), Oliver Faugeras (Foreword), Joël Janin
6. Medical Imaging Informatics, 2010th Edition, Alex A.T. Bui, Ricky K. Taira

BME 7529 Nuclear Physics in Biomedical Applications

This course will focus on applications in medicine and the underlying basics of nuclear physics, physical foundations, instrumentation, diagnostics (imaging), therapies and radiation safety. The nuclear and particle physics group studies the fundamental constituents of Nature which includes particle physics and all of the primary forces including gravitation. Particles and fields are studied at the experimentally accessible levels of nucleons, quark structure, and with significant research efforts to go beyond present day accessibility. The molecular imaging specialty includes the core and required courses with the department, graduate courses from physics, engineering, chemistry/biochemistry, pharmacology, and biomathematics, and research study and seminar courses. Students must demonstrate competence in the subject matter covered in the core courses. Because of the breadth of radiation biology and experimental radiation oncology, it is not feasible to design a single curriculum for all students. Instead, additional coursework is recommended by faculty in accordance with specific needs.

Text & Reference Books:

1. Medical Applications of Nuclear Physics (Biological and Medical Physics, Biomedical Engineering), 2004th Edition, K. Bethge, G. Kraft, P. Kreisler, Gertrud Walter
2. 14 MeV Neutrons: Physics and Applications, Vladivoj Valkovic
3. Ion Beam Therapy: Fundamentals, Technology, Clinical Applications (Biological and Medical Physics, Biomedical Engineering), 2012th Edition, Ute Linz
4. Optical Polarization in Biomedical Applications (Biological and Medical Physics, Biomedical Engineering), 2006th Edition, Valery V. Tuchin, Lihong Wang, Dmitry A. Zimnyakov
5. Monte Carlo Calculations in Nuclear Medicine, Second Edition: Applications in Diagnostic Imaging (Series in Medical Physics and Biomedical Engineering), 2nd Edition, Michael Ljungberg, Sven-Erik Strand, Michael A. King
6. Structural Biology: Practical NMR Applications, 2nd ed. 2013 Edition, Quincy Teng
7. Radiation Damage in Biomolecular Systems (Biological and Medical Physics, Biomedical Engineering), 2012th Edition, Gustavo García Gómez-Tejedor (Editor), Martina Christina Fuss

BME 7531 Numerical Modeling of Artificial Brace & Limbs

This course explores the principles and practices of rehabilitation engineering and the role of engineers in the delivery of health care to disabled individuals. Discussions of approaches to diagnosis and treatment of disorders involving motor function will be included as will an analysis of the design of devices and systems to aid the disabled. Disabilities as a result of stroke, spinal cord disorders, cerebral palsy and Parkinson's disease will be discussed. Examples of technologies examined include devices aiding mobility, limb prosthetics, robotic aids, functional electrical stimulation, and interfaces to microcomputers. Reliability engineering is performed throughout the entire life cycle of a system, including development, test, production and operation. In this introductory course, we will explore such topics as: problem solving strategies, Failure Mode and Effects Analysis (FMEA); Failure Mode Effects and Criticality Analysis (FMECA); Reliability simulation modeling; Validation and Verification Analysis; Thermal analysis; Fault Tree analysis; Taguchi Method; Ishikawa Method; Human reliability; Built-in test (BIT); Maintainability, Maintenance and Availability Analysis's. Reliability Software will also be reviewed. Real life engineering failures will be examined and discussed. This course is designed to be

project-oriented with hands-on experience. Major topics are tailored to student interests (student centered learning).

Text & Reference Books:

1. Class 1 Devices: Case Studies in Medical Devices Design, 1st Edition, Peter J Ogrodnik
2. Principles of Human Joint Replacement: Design and Clinical Application, 2nd edition. 2015 Edition, Frederick F. Buechel, Michael J. Pappas
3. Targeted Muscle Reinnervation: A Neural Interface for Artificial Limbs (Series in Medical Physics and Biomedical Engineering), 1st Edition, Todd A. Kuiken (Editor), Aimee E. Schultz Feuser (Editor), Ann K. Barlow
4. Powered Upper Limb Prostheses: Control, Implementation and Clinical Application, 1st Edition, Ashok Muzumdar
5. Devices for Mobility and Manipulation for People with Reduced Abilities (Rehabilitation Science in Practice Series), 1st Edition, Teodiano Freire Bastos-Filho (Author), Dinesh Kumar (Author), Sridhar Poosapadi Arjunan

BME 7533 Physiology and Anatomy for Biomedical Engineering

This course is designed to provide the physiological background necessary for advanced work in biomedical engineering. A quantitative model-oriented approach to physiological systems is stressed. Several topics include the cell and its chemistry, transport and the cell membrane, properties of excitable tissue and muscle, the cardiovascular system and the respiratory system. This course covers anatomy of the nervous system, structure and functions of the auditory and visual systems, motor systems, the kidney and gastrointestinal tract, and the neural and neuroendocrine control of the circulation. The Syllabus of this course will be followed as;

- Cell Transport and Nernst Potential
- Excitable Membranes and Synapses
- Skeletal, Smooth and Cardiac Muscle
- Cardiac Electrophysiology and ECGs
- Cardiac Mechanics and Systemic Circulation
- Control of the Cardiovascular System
- Repiratory Mechanics, Gas Transport, and Control of Breathing
- Autonomic Nervous System
- Central Nervous System: Brain and Spinal Cord
- Somatic Nerves and Control of Movement
- Auditory System
- Visual System
- Renal System
- Endocrine System

Text & Reference Books:

1. Human Anatomy & Physiology (9th Edition), *9th Edition*, Elaine N. Marieb, Katja N. Hoehn
2. Anatomy & Physiology: The Unity of Form and Function, *7th Edition*, Kenneth Saladin
3. Anatomy and Physiology of the Circulatory and Ventilatory Systems (Biomathematical and Biomechanical Modeling of the Circulatory and Ventilatory Systems), *2014th Edition*, Marc Thiriet
4. Engineering Physiology: Bases of Human Factors Engineering/ Ergonomics, *2010th Edition*, Karl H. E. Kroemer, Hiltrud J. Kroemer, Katrin E. Kroemer-Elbert
5. Exploring Anatomy & Physiology in the Laboratory, *2nd Edition*, Erin C. Amerman

BME 7535 Principles of Medical Imaging & Processing

With an emphasis on the physical principles behind modern medical imaging, this course will cover topics such as mathematical and physical foundations of imaging; image construction and interpretation; image quality and image processing. Individual modules will cover various imaging modalities to provide an advanced understanding of the physics of the signal and its interaction with biological tissue; image formation or reconstruction; modality specific issues for image quality; clinical applications; biological effects and safety. This course covers digital image processing techniques used for the analysis of medical images such as x-ray, ultrasound, CT, MRI, PET, microscopy, etc. The presented image enhancement algorithms are used for improving the visibility of significant structures as well as for facilitating subsequent automated processing. The localization and identification of target structures in medical images are addressed with several segmentation and pattern recognition algorithms of moderate complexity. Image reconstruction algorithms used for three-dimensional image formation are presented. The course covers image registration algorithms used to determine the correspondence of multiple images of the same anatomical structure. Image compression algorithms applied to medical images are also addressed. Final modules will briefly touch upon image analysis and describe applications for clinical diagnosis and/or treatment. The Syllabus of this course will be followed as;

Syllabus

- Introductory Image Processing
- Radiography
- Computed Tomography
- Magentic Resonance Imaging
- Ultrasound Imaging
- General Imge Characteristics
- Image Anaylsis
- Applications of Imaging
- Future Frontiers of Imaging

Text & Reference Books:

1. Fundamentals of Medical Imaging, Paul Suetens
2. Medical Image Processing, Reconstruction and Restoration: Concepts and Methods, Jiri Jan

3. Image Processing with MATLAB: Applications in Medicine and Biology, Omer Demirkaya, Musa H. Asyali, Prasanna K. Sahoo

4. Principles of Radiographic Imaging: An Art and a Science (Carlton,Principles of Radiographic Imaging), 2005th Edition, Richard R. Carlton and Arlene McKenna Adler
5. Principles of Magnetic Resonance Imaging: A Signal Processing Perspective, 1st Edition, Zhi-Pei Liang, Paul C. Lauterbur
6. Principles of 3D Image Analysis and Synthesis (The Springer International Series in Engineering and Computer Science), *2000th Edition*, Bernd Girod (Editor), Günther Greiner (Editor), Heinrich Niemann

BME 7537 Principles of Neuroscience & Neuroengineering

This course covers theoretical methods for analyzing information encoding and representing function in neural systems, including models of single and multiple neural spike trains based on stochastic processes and information theory, detection and estimation of behaviorally relevant parameters from spike trains, system theoretic methods for analyzing sensory receptive fields, and network models of neural systems. Both theoretical methods and the properties of specific well-studied neural systems will be discussed. This course also covers the physiology of hearing from a model-oriented viewpoint. Topics include basilar membrane mechanics, models of cochlear transduction, stochastic process models of neural discharge, detection of theoretic approaches to relating physiological and psychological data, models of signal processing in central auditory nuclei, and nonlinear methods of characterizing neurons.

Text & Reference Books:

1. Neuroengineering, 1st Edition, Daniel J. DiLorenzo (Editor), Joseph D. Bronzino
2. From Neurology to Methodology and Back: An Introduction to Clinical Neuroengineering, 2012th Edition, Natasha Maurits
3. Brain Extracellular Matrix in Health and Disease, Volume 214 (Progress in Brain Research), 1st Edition, Alexander Dityatev (Editor), Bernhard Wehrle-Haller (Editor), Asla Pitkänen

4. Electrochemical Methods for Neuroscience (Frontiers in Neuroengineering Series), *2006th Edition*, Adrian C. Michael and Laura Borland

5. Humanoid Robotics and Neuroscience: Science, Engineering and Society (Frontiers in Neuroengineering Series), 1st Edition, Gordon Cheng

BME 7502 Seminar (Non credit)

Discussion by postgraduate students of their research project and other topics of current interest in Biomedical Engineering.

CHAPTER 3

DRAFT ORDINANCE FOR MASTERS DEGREE PROGRAM IN BM E DEPARTMENT

1. Degrees Offered

The Master degrees to be offered under this Ordinance are as follows:

1.1 Master of Science in

Biomedical Engineering abbreviated as M.Sc. Engg (Biomedical)

1.2. Master of Engineering in

Biomedical Engineering abbreviated as M. Engg (Biomedical)

1.3 Any other Master Degrees approved by the Academic Council may also be offered under this ordinance.

2. Admission Requirements

2.1 For admission to the courses leading to a Masters degree (M.Sc. Engg / M. Engg), an applicant

(a) Must have a minimum GPA of 4.0 out of 5.00 or a first division or equivalent in any one of S. S. C and H. S. C or in equivalent examinations and must not have a GPA less than 3.00 out of 5.00 or a second division or equivalent in any of the aforementioned examinations.

(b) Musst have at least 55% marks or a minimum GPA of 2.75 out of 4.0 or its equivalent in B. Sc. Engg. in Biomedical Engineering, Biomedical Science, Medical Physics & Biomedical Engineering, Medical Physics, MBBS or BDS, Hospital planning, design & management, Animal Science, Health Science, Bioinformatics, Biotechnology & Genetic Engineering, Biotechnology, Genetic Engineering, Genetics, Computer Science & Engineering, Electrical & Electronics Engineering, Electrical, Electronics & Communication Engineering, Nuclear medicine, Civil Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering, Pharmacy, Biochemistry, Biomedicine, Immunology, Microbiology, Molecular Biology, Applied Chemistry, Applied Physics, Nutrition & Food Engineering, Laboratory Science & related fields.

2.2 For admission to the courses leading to the degree of M.Sc. Engg /M. Engg in any division, an applicant must have obtained a B.Sc. Engg Degree in the relevant branch or an equivalent degree from any recognized institution. An applicant with a B.Sc. Engg Degree in other branches of engineering may also be eligible for admission to the courses leading to the degree of M.Sc. / M. Engg. In such cases, the selected candidate may be required to undertake non-credit prerequisite courses at the undergraduate and / or postgraduate level as may be determined by the Board of Post Graduate Studies (BPGS) of concerned Engineering Department. BPGS shall be constituted as follows:

i. Chairman : Head of the concerned Engineering Department.
ii. Member : Instructor Class A or equivalent and above faculty of the department.
iii. Internal Member : One Senior Instructor from other Department of MIST.
iv. Member Secretary : Course Coordinator.

3. Admission and Registration Procedures

3.1 Applications for admission to the above courses shall be invited through regular means of advertisement and shall be received by the Admission Officer.

3.2 Before being finally selected for admission a candidate may be required to appear at an oral and / or written test by a Selection Committee as constituted by the BPGS. He/She will be required to take pre-requisite courses as may be prescribed by the Selection Committee. Every selected candidate, unless he/she has already been registered, shall get himself/herself registered with Bangladesh University of Professionals (BUP).

3.3 After admission each student shall be assigned, by the relevant BPGS, an Adviser from among the teachers of the Department not below the rank of an Assistant Professor/Instructor Class A. In advance of each enrolment and course registration for any semester, the Adviser or Supervisor (as appointed by Art. 8.1 & 9.1 of this ordinance) shall check and approve his/her student's schedule for subjects, pre-requisites as recommended by the Selection Committee and the total hours. The student is expected to consult his/her Adviser/Supervisor on all academic matters but, it is the responsibility of the individual student to see that his/her schedule conforms to the academic regulations.

3.4 Every registered student shall get himself/herself enrolled on payment of prescribed fees and other dues as per MIST and BUP rules before the commencement of each semester. In an academic year there will be normally two semesters. All course registration must be completed within two weeks from the start of a semester.

3.5 On the recommendation of the appropriate BPGS and Committee for Advanced Studies and Research (CASR), the rules for admission into the Institute for master/post graduate studies shall be framed from time to time by the Academic Council. CASR on its own may, if it deems fit, recommend such rules for admission for approval of the Academic Council.

CASR shall be constituted as follows:

i. Chairman : Commandant, MIST
ii. Member : Dean, Faculty of Technical & Engg. Studies, BUP.
iii. Member : Dean (Dir Academic), MIST
iv. Member : One Senior Instructor/Professor from all departments.
v. Member : BUET (one professor nominated by VC BUET).
vi. Member Secretary : Director, R& D, MIST.

3.6 No late registration will be allowed after two weeks of designated dates of registration. Late registration after this date may only be accepted for thesis/project if the student submits a written appeal to the Dean, MIST through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Medical Officer (MO) of the Institute or some other academic commitments which precluded registration prior to the last date of registration. Students will be charged a late registration fee of Tk. 1000.00 (One thousand) only. This extra fee will not be waived whatever be the reason for late registration.

3.7 If a student is unable to complete the final examination of a semester due to serious illness or serious accident or official commitment he/she may apply to the Dean, MIST in a prescribed form through Head of the degree awarding Department for total withdrawal from the semester within a week after the end of the semester final examination. The application must be supported by a medical certificate from the MO, CMH or relevant official documents. The Academic Council will take the final decision about such application on the recommendation of the relevant BPGS.

4. Academic Requirements and Regulations

4.1 The minimum duration of the M.Sc. Engg./ M. Engg. Program shall be of three semesters. A candidate for the Master's degree must complete all the requirements for the degree within five academic years (Session) from the date of the first admission in the respective program.

4.2 Academic progress shall be measured in terms of credit hours earned by a student. One credit hour subject shall normally require 14 hours of lecture for one semester; while one credit hour for thesis/project/ laboratory should normally require 42 hours of work for one semester. The number of credit hours for each subject shall be as specified in the

syllabus of the respective branch of Engineering Department.

4.3 The credit hour requirement for the Masters Program shall be as follows:

4.3.1 For the degree of M.Sc. Engg, a student must earn a minimum of 36 credit hours including a thesis for which 18 credit hours shall be assigned.

4.3.2 For the degree of M. Engg a student must earn a minimum of 36 credit hours including a project for which 9 credit hours shall be assigned.

4.4 There shall be two categories of students, namely, full-time students and part-time students.

4.4.1 A student may enroll as a part-time student. Students, serving in different organizations, may also be admitted as part time student with the written consent of the employer. A part time student may be assigned a minimum of 3 credit hours to a maximum of 9 credit hours of course including thesis/ project work in any semester.

4.4.2 Full time students must register for a minimum of 12 credit hours and a maximum of 15 credit hours per semester. A full time student shall not be allowed to be in the employment of any organization (even as a part time employee). However, they may be employed as teaching/ research assistant at the Institute. If a full time student becomes an employee (full time or part time) of any other organization in the middle of a semester, he/she may, with the approval of the Head of the Department and his/her Employer, be allowed to continue as a full time student for that semester.

4.4.3 A student may be allowed to switch from part-time to full-time or vice versa on the recommendation of the respective BPGS before the commencement of a semester.

4.5 The courses of study in different departments shall be as recommended by the respective BPGS and CASR and approved by the Academic Council. The BPGS may review the curriculum from time to time and recommend any changes as may be considered necessary. The courses to be offered in any semester shall also be as determined by the relevant BPGS.

4.6 A student on the recommendation of the relevant BPGS and as approved by the CASR may be allowed to transfer a maximum of 9.0 credits of the courses completed by the student at a recognized institution provided that the courses were not taken earlier than five calendar years from the date of his/her first enrolment in the respective program at MIST and that the student obtained a minimum GPA of 3.0 out of 4.0 or its equivalent in such courses and that the courses are equivalent to the approved courses of MIST.

5. Grading system

5.1 Final grades for courses shall be recorded as follows:

Grade	Merit description	Grade points
A^+ (Plus)	Outstanding	4.0
A	Excellent	3.75
A^- (Minus)	Very Good	3.50
B^+(Plus)	Good	3.25
B	Above Average	3.0
B^- (Minus)	High Average	2.75
C^+ (Plus)	Average	2.50
C	Below Average	2.25
D	Pass	2.0
F	Failure	0.0
I	Incomplete	--
S	Satisfactory	--
U	Unsatisfactory	--
W	Withdrawn	--

5.2 Courses in which the student gets F grades shall not be counted towards credit hour requirements and for the calculation of Grade Point Average (GPA).

5.2.1 The C grades, up to a maximum of two courses, may be ignored for calculation of GPA at the written request of the student to the Head of the Department on the recommendation of the supervisor / Advisor, provided that the student has fulfilled the total course credit hour requirement in the remaining subjects with a minimum GPA of 2.20.

5.2.2 When a course is repeated for improvement, better grade shall be counted for calculation of GPA.

5.2.3 Performance in all the subjects including all the F grades shall be reflected in the transcript.

5.3 Grade I is given only when a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond his/her control. He/She must apply to the Head of the Department within one week after the examination to get an I grade in that course. It must be completed within the next two semesters provided the same course is offered. He/She may, however, be allowed to register without further payment of tuition fees for that course. If that course is not offered within next two semesters, then he/she will be allowed to register another course of his/her choice.

5.4 Satisfactory or Unsatisfactory- used only as final grades for thesis/project and non-credit courses. Grade for thesis/ project "In Progress" shall be so recorded. If, however, thesis / project is discontinued an 'I' grade shall be recorded.

5.5 Students may enroll for non-credit course(s) termed as audit course(s) on recommendation of his/her thesis / project Supervisor and Head of the Department.

5.6 A student shall withdraw officially from a course within four working weeks of the commencement of the semester or else his grade in that course shall be recorded as F unless he/she is eligible to get a grade of I. A student may be permitted to withdraw and change his/her course within the specified period with the approval of his/her Adviser, Head of the Department and the respective teacher(s) concerned. (In that case his / her grade in the courses registered shall be recorded as 'W' in his Academic Record but shall not be reflected in the transcript.)

5.7 Numerical markings may be made in answer scripts, tests etc., but all final grading to be reported to the Controller of Examinations (BUP) shall be in the letter grade system as detailed below:

80% and above		:	A (Plus)
75% to below	80%	:	A
70% to below	75%	:	A- (Minus)
65% to below	70%	:	B+ (Plus)
60% to below	65%	:	B
55% to below	60%	:	B- (Minus)
50% to below	55%	:	C+ (Plus)
45% to below	50%	:	C
40% to below	45%	:	D
Below 40%		:	F

6. Conduct of Examination

6.1 In addition to tests, assignments and/ or examinations during the semester as may be given by the teacher(s) concerned, there shall be a written examination and / or other tests for each of the subjects offered in a semester at the end of that semester, the dates of which shall be announced by the Exam Section, MIST as advised by Dean in coordination with BUP at least two weeks before the commencement of the examination. The final grade in a subject shall be based on the performance in all tests, assignments and / or examinations.

6.2 The Exam Section and BUP shall keep up to-date record of all the grades obtained by a student in individual Academic Record Card. Grades shall be announced by the Controller of Examinations at the end of each semester. In addition, each student is entitled to one official transcript of the University record at the completion of his academic program from the office of the Controller of Examinations on production of statement of clearance from all departments' offices.

6.3 The BPGS of the department shall recommend the names of the paper setters and examiners for the semester examinations at least two weeks before the date of

commencement of the examination to the Commandant MIST/VC BUP for approval.

7. Qualifying Requirements

7.1 The qualifying requirement for graduation is that a student must earn a minimum grade point of 2.65 based on the weighted average in his course work.

7.1.1 Two courses may be repeated for improvement with the prior approval of the Head of the Department on the recommendation of the Supervisor / Advisor. Such approval shall be reported to the BPGS.

7.1.2 A student obtaining F grade in a course may be allowed to repeat the course with the prior approval of Head of the Department on the recommendation of the Supervisor / Advisor. Such approval shall be reported to the BPGS.

7.2 A student shall not be allowed to continue the program if he/she obtains a total of three or more F grades in one or more than one subjects taken together, during the course of his / her studies.

7.3 If the cumulative GPA falls below 2.5 for a full time student at the end of the second or any subsequent semester or for a part time student at the end of third or subsequent semester, he/she shall not be allowed to continue in the program.

7.4 In addition to successful completion of course works every student shall submit a thesis on his research work or a report on his/her project work, fulfilling the requirements as detailed in the following sections.

8. Thesis

8.1. Research work for a thesis shall be carried out under the supervision of a full-time member of the staff belonging to the relevant department of MIST/BUET/any other university recognized by UGC. However, in special cases, a full-time member of the staff belonging to a department outside the student's relevant department of the Institute may be appointed as Supervisor, if the research content of the thesis is within the field of specialization of the member of the staff. A Co-supervisor from within or outside the department may be appointed, if necessary. The thesis proposal of a student shall be submitted for approval to the CASR on the recommendation of the BPGS after completion of at least 12 credit hours of course work.

8.2 If any change is necessary of the approved thesis (title, content, cost, Supervisor, Co-supervisor etc.) it shall be approved by the CASR on recommendation of the relevant BPGS.

8.3 The research work must be carried out in this Institute or at a place(s) recommended by the BPGS. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work outside the institute.

8.4 Every student shall submit to the Head of the Department, through his/her Supervisor, required number of type written copies of his/her thesis in the approved format (as given in Appendix-A) on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the Department.

8.5 The student shall certify (as given in Appendix-B) that the research work was done by him/her and that this work has not been submitted elsewhere for the award of any other diploma or degree.

8.6 The thesis should demonstrate an evidence of satisfactory knowledge in the field of research undertaken by the student.

8.7 Every student submitting a thesis in partial fulfillment of the requirements of a degree, shall be required to appear at an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the Head of the Department and must satisfy the examiners that he/she is capable of intelligently applying the results of this research to the solution of problems, of undertaking independent work, and also afford evidence of satisfactory knowledge related to the theory and technique used in his/her research work

8.8 Examination Board

8.8.1 An Examination Board for every student for thesis and oral examination shall be approved by the CASR on recommendation of the thesis Supervisor in consultation with the Head of the Department and to be forwarded to BUP for final approval. The Supervisor shall act as the Chairman and the Head of the Department will be an ex-officio member of the Examination Board. The Board shall consist of at least four members including the Head of the Department and the Supervisor. The Examination Board shall be constituted as follows:

(i) Supervisor	Chairman
(ii) Co-supervisor (if any)	Member
(iii) Head of the Department	Member (ex-officio)
(iv) One or two members from within the Dept/Institute	Member
(v) One external member from outside the student's relevant Department/Institute	Member External)

8.8.2 If any examiner is unable to accept the appointment or has to relinquish his/her appointment before the examination, Commandant, MIST shall appoint another examiner in his/her place, on suggestion from the Supervisor in consultation with the Head of the department. This appointment will be reported to the CASR.

8.8.3 In case a student fails to satisfy the Examination Board in thesis and /or oral examination, the student shall be given one more chance to resubmit the thesis and/or appear in oral examination as recommended by the Board.

9. Project

9.1 Project work shall be carried out under the supervision of a full-time member of the staff belonging to the relevant department of MIST/BUET/any other university recognized by UGC. However, in special cases, a full- time member of the staff belonging to a department outside the student's relevant Department may be appointed as Supervisor, if the research content of the project work is within the field of specialization of the member of the staff. The title of the project, cost and the Supervisor shall be recommended by the BPGS for approval of the Commandant. This approval will be reported to the CASR.

9.2 If any change is necessary of the approved project (title, content, cost, Supervisor etc.) it shall be approved by the Commandant on the recommendation of the relevant BPGS. This approval will be reported to the CASR.

9.3 The project work must be carried out in this Institute or at a place approved by the Commandant on recommendation of the Supervisor in consultation with the Head of the Department. The work schedule and financial involvement should be mentioned in the project proposal for carrying out project work outside the institute.

9.4 Every student shall submit to the Head of the Department, through his/her Supervisor, required number of type written copies of his/her project report in the approved format (As given in Appendix- A) on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the Department.

9.5 The student shall certify (as given in Appendix-B) that the research work was done by him/her and that this work has not been submitted elsewhere for the award of any other diploma or degree.

9.6 Every student submitting a project report in partial fulfillment of the requirement of a degree shall be required to appear at an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the Head of the Department and must satisfy the examiners that he/she has gained satisfactory knowledge related to the project work.

9.7. Examination Board

9.7.1 An Examination Board for every student for the project and oral examination shall consist of at least three members including the Supervisor. The Supervisor shall act as the Chairman. The BPGS shall recommend the names of the examiners for approval of the BUP. This approval will be reported to the CASR. The Examination Board shall be constituted as follows:

(i)	Supervisor	:Chairman
(ii)	One member from within the Dept/Institute	:Member
(iii)	Head of the department	:Member (ex-offico)
(iv)	One member from outside the Dept/Institute	:Member (External)

9.7.2 If any examiner is unable to accept the appointment or has to relinquish his/her appointment before the examination, the Commandant shall appoint another examiner in his/her place on the recommendation of the relevant BPGS. This appointment will be reported to the CASR.

9.7.3 In case a student fails to satisfy the Examination Board in project report and /or oral examination, the student shall be given one more chance to resubmit the project report and/or appear in oral examination as recommended by the Board.

10.0 Striking off and removal of names from the rolls

10.1 The name of the student shall be struck off and / or removed from the rolls of the Institute on the following grounds:

(i) Non-payment of dues within prescribed period. Master/Post graduate students residing in the student hall (Osmany Hall) shall be subject to the same conditions as allowed in the Policies Relating to the Hall of Residence and Discipline.

(ii) Failing to proceed with the program by the exercise of the Art. 4.1, 7.2 or 7.3 of this Ordinance.

(iii) Failing to make satisfactory progress in his/her program as reported by the supervisor through the BPGS and approved by CASR.

(iv) Forced to discontinue his/her studies by the Committee of Discipline.

(v) Withdrawn officially from the Masters Degree Program.

11.0 Academic fees

Items of Academic fees shall be as per Appendix-C, and these fees shall be reviewed and recommended from time to time by the Academic Council of MIST and approved by Governing Body of MIST.

12.0 Refund of Fees

A student withdrawing officially from all courses and / or thesis/project as per Art. 10(v) is entitled to get a refund of 50% of the course registration fees provided he / she withdraws in writing through the respective Head of the Department before the expiry of four working weeks from the commencement of the classes. Thesis / project registration fees in any case are not refundable.

APPENDIX-A

FORMAT FOR THESIS OF MASTERS AND PROJECT REPORT OF M.Sc./M. ENGG

PART A
Formal Requirements

This following set of instructions may be followed as standard format for the thesis / project report.

1. General requirements

The Department normally requires that a thesis should be submitted for examination in written format, with supporting materials, artifacts or products as appropriate to the research program on or before prescribe date.

The thesis shall be in English unless otherwise specified.

1.2. Length of theses

Department does not prescribe the length of a thesis, except to require that no thesis be longer than 50,000 words. Theses must provide sufficient content material to demonstrate that students have fulfilled the criteria of the project.

1. Size and Thickness of Paper:

Thesis/project is to be printed on A4 size quality offset paper and minimum weight of paper should be 80 gm.

2. Typing or Print:

The typeface should be consistent and the copy must be clean for both text and illustration. Dot matrix printers should not be used unless giving near letter quality. The general text of the thesis/project report should be spaced at one and a half with single spacing for footnotes or lengthy quotations. Triple or larger spacing may be used where necessary to set off headings, subheadings or illustrations. The thesis/project report must be in “letter quality” print and laser printing is recommended. Any standard type (font) may be used but it must be consistent throughout. The print size should be at least 10 points (or equivalent) not exceeding 12 points.

3. Margins and Layout of Text:

There must be a margin of 4 cm to allow for binding on the left hand side of the paper. Minimum margins of 3 cm are required at the top and the bottom. A 2.5 cm margin is required at the right hand side. This also applies to tables and figures.

4. **Pagination:**

The text is to be numbered consecutively in the bottom middle of the page. The number does

not appear on the first page of the text although is understood to be a numeral '1'. All figures, tables, appendices and similar materials are numbered as pages of the text through to the end of the thesis/project report. Material preceding the first page of the text is to be numbered in small roman numerals centered at the bottom of each page. The title page is considered to be a page but is not so indicated.

5. Word Spacing and Division:

Text should be set to ensure an even spacing between words for any particular line. Word division at the ends of lines (hyphenation) should be avoided if possible.

6. Illustrations:

Tables, figures, photographs, and other illustrations must always be referred to in the text. They should be arranged neatly and effectively. They should be in black ink, or be high quality photocopies, photo-offset, or photographs. They should be presented on paper of similar weight to that used in the thesis/project report. Oversize maps, charts or diagrams must be folded so that they can be bound with the pages or inserted in a pocket. Original photographs or photo-offset must be provided in all required copies of the thesis/project report. They should be properly pasted on paper with permanent non-wrinkle glue. Photographs printed on 21.5 cm x 28 cm (8 ½ in x 11 in) photographic paper or photo-offsets are preferred rather than being pasted on. High quality computer graphics (black and white or colour) and high-quality colour photocopies are acceptable. All required copies must be identical. The title of a table must be above the table and the title on the figure, below the figure. The student should consult with the thesis/project supervisor if any difficulty arises in the placing of illustrations.

7. Computer Disks:

If a student has to include computer disks as a part of his data, he must submit a disk for each required copy of this thesis. These must be submitted loosely. It is not necessary to submit them at the time he schedules his defence. In this case, there should be a pocket in the thesis/project report on the inside back cover. He should also indicate the presence of CD/DVD in his Table of Contents.

8. Binding and Colour:

Sewn and bound in strong, waterproof cloth. Not more than 3.5 cm thick. Black colour for M. Sc Engg; Maroon for M. Engg.

9. Lettering:

In golden on spine only.
Top : Degree

Middle : Name of author (initials and surname)

Foot : Year of presentation

Cover Page : Centre Justified. Title, Name, Dept., Passing Month Year

Spine : At the bottom and across: the word "MIST".

90 mm from the bottom and across: the degree and year of project approval, for example:

MSc

2015

90 mm from the top and across: the initials and surname of the author.

Evenly spaced along the spine, from top to bottom: the title of the thesis. In cases where the thesis title will not fit along the spine, an abbreviated title should be provided.

No other lettering or decoration shall appear on the spine.

10. Order of Items:

10.1. Title Page

The student should follow the following instruction for title page:

10.1.1. The title of the thesis should appear in 12 point boldface capital each word.

10.1.2. The word 'by' should be in lower case letters.

10.1.3. The name of the author should be in upper and lower case letters, and should be identical to the one in the copyright page. The name used must be the student's legal name as it appears on the MIST records.

10.1.4. Write out the full name of the degree in uppercase letters for which the work is presented, e.g. MASTER OF SCIENCE IN MECHANICAL ENGINEERING.

10.1.5. Under major subject, write out your department / Institute or school's name in full e.g. Mechanical Engineering.

10.1.6. Type MILITARY INSTITUTE OF SCIENCE AND TECHNICAL (MIST) in uppercase letters.

10.1.7. The date of the title page should indicate only the year of the defence.

10.2. Certification page of Thesis / Project Report Approval:

The certification page of thesis /Project Report Approval should be as per the format of Annex 1 of this Appendix.

10.3. Declaration Page:

The Declaration page should be as per the format of Appendix-A.

10.4. Dedication (optional):

10.5 Table of Contents:

The decimal system is advised for mentioning the headings and subheadings of the chapter. Each heading and subheading appearing in the Table of Contents must appear in the text of the thesis / project report.

10.6 List of Tables and Figures :

A list of Tables and Figures should follow the Table of Contents. Each should appear on separate page with the appropriate page numbers. However, if the lists are very short they may be combined on one page under the title "List of Tables and Figures". It is advised that the decimal system (e.g. figure 3.2 is the second figure in chapter 3) be used for figures if this system is followed for headings.

10.7 List of Abbreviations of Technical Symbols and Terms :

Page of the list of abbreviations of Technical Symbols and Terms should be incorporated following the page of list of Tables and Figures. In this respect the student is advised to consult information sources available in the Central Library. These abbreviations are also frequently found listed at the back of standard texts on technical writing.

10.8. Acknowledgments:

These should be given on a page following the List of Abbreviations of Technical Symbols and Terms. The student should acknowledge advice, service encouragement, library and information service support and source of financial support.

10.9. Abstract :

The student is required to incorporate an abstract following the page of acknowledgment. The abstract must be no longer than can be accommodated in single space type on one side page only.

10.10. Main Body of Text :

10.10.1 Headings and Sub-headings:

Headings and subheadings of the text must be consistent and correspond to the headings given in the Table of Contents. Each major chapter should begin on a new page.

10.11. References:

The department does not prescribe the form of referencing to be used, but it is essential that students be absolutely consistent in their use of a single method throughout the thesis. The

style used should accord with norms for the discipline and should be agreed in consultation with supervisors.

Methods of referencing a wide variety of source materials and information on bibliographies are given in the End Chapters. This volume also contains valuable information on writing conventions and copy preparation, and all candidates are strongly advised to consult it. **Part B** also offers some suggestions.

10.12 Appendices:

Appendices should contain supplementary material that the author considers necessary to the interpretation of the text itself. Long tables, essential raw data, detailed reports or computer are generally more appropriately included in an appendix. Appendices should not be longer that the body of the thesis and normally would be considerably shorter. If there is more than one appendix, the appendices should be numbered in sequence using Arabic numerals.

Appendices should be numbered as A-1, A-2, … B-1, B-2… etc. for respective appendix.

PART B

STRUCTURE OF A THESIS

Generic Format for Thesis Body

Chapter Number	***Content***
1	***Introduction*** *Provides background and introduces the methodology and structure of the thesis*
2	***Literature Review*** *Demonstrates how the research and methodology follow on from an impartial assessment of other learned work*
3	***Methodology and Implementation*** *Explains the methodology in detail and the key issues in implementation*
4	***Experimental Procedures for Methodology Assessment*** *Explains how the limits of the methodology were impartially and scientifically assessed*
5	***Experimental Results and Observations*** *Provides tabulated outcomes and brief observations of the significance of the experiments*
6	***Broad Context Discussion of Results and Relevance*** *Provides an insight into the relative contributions of the work to the field of study, to industry or society*
7	***Conclusions and Recommendations for Further Work*** *A balanced discussion on the positive and negative attributes of the work; its limitations and further areas to be examined*

An Overall Framework for Theses

Thesis Item	***Purpose***
Abstract	A 200-250 word general description of the thesis, and main subjects covered therein. This is used by libraries for cataloguing purposes. The abstract is the first page seen by a reader after the title page. Abstract pages are normally not numbered.
Acknowledgments	An optional section which acknowledges the contributions of other researchers or organisations which have made facilities available to the researcher. No page numbering is ascribed to the Acknowledgments section
Table of Contents	A listing of all chapters, sections and subsections, followed by a listing of all line-art drawings (referred to as "figures"), photographs/grey-scale images (referred to as "plates") and tables. Page numbering for this section of the thesis normally consists of lower-case Roman Numerals in brackets - for example (i), (ii), etc.
Chapter 1 - Introduction (Thesis Body)	This is the most crucial chapter in the thesis and the one which requires the most careful consideration. The reader must be introduced, in a step by step fashion, to the purpose of the project, concepts and ideas related to the project and the structure of the following sections of the thesis. This section should endeavour to treat technical issues in a ***qualitative*** manner so that the reader can clearly understand the task at hand, without reference to other texts or periodicals. Formal page numbering for the body of the thesis begins in this section. Pages should preferably be numbered in a simple sequential order and should be chapter independent (ie: page numbers such as 1.2, 2.7 are not appropriate).
Chapters 2..N (Thesis Body)	This is the portion of the thesis in which literature surveys are discussed, research and development techniques are explained, theories, models and systems formulated and results evaluated. In general, the body of the thesis should be free from long, complex calculations, routine mathematical proofs, program code or large volumes of raw data. Page numbering continues on from the introductory chapter.
Chapter N+1 Conclusions and Recommendations for Further Work	This should draw together the main findings of the research program, together with findings of literature surveys carried out at the beginning and the end of the research program. Recommendations should also be made for future research in related areas. Page numbering should be a continuation from the previous section.
References	A listing of all references from which data has been abstracted for the purposes of the thesis. Preferably, the references should be listed in the order in which they are referred to in the body of the thesis. Page numbering is a continuation of previous sections.
Appendices	Appendices are used to store important calculations, proofs, tables or code which would interrupt the flow of qualitative descriptions in the body of the thesis. Each appendix has its own page numbering scheme. For example, Appendix A would have numbers A-1, A-2, etc. Appendix X would have numbers X-1, X-2, etc.
Index	This is generally an optional section in which common words or phrases, occurring in the body of the thesis are referenced to page numbers. Modern word-processors make the task of compiling an index considerably easier and hence authors may wish to include them. Page numbering can be a continuation of the Appendix Format.

Thesis Complexity by Chapter

Complexity	***Chapter***	***Function***
Lay-reader		Abstract
Lay-reader	1	Introduction
	2	Literature Review
Expert	3	Methodology and Implementation
	4	Experimental Procedures for Methodology Assessment
	5	Experimental Results and Observations
	6	Broad Context Discussion of Results and Relevance
Lay-reader	7	Conclusions and Recommendations for Further Work
-	-	References
-	-	Appendices

Chapter Complexity and Linking

Complexity	***Section***	***Function***	***Comments***
Lay-reader	X.1	Overview	Provides an overview of the chapter and its structure, and a description of what is intended to be achieved by providing this documentation A description of why and how this chapter follows on from the previous chapter
	X.2		
Expert	X.3		
	X.4		
	X.5		
	:		
Lay-reader	X.N	Summation	A summary of what the chapter contains A description of how this leads into the next chapter

Referencing

1. SMITH, A. and Jones, B., "New Techniques in Integral Calculus", International Journal of Mathematics, Volume 6, No. 23, 1977, Pages 221-229
2. HARRIS, D., "Dynamic Control of a.c. Servo-Motors", 2nd Edition, Addison Wesley Publishers, 1992, Pages 34-77

26. BROWN, F., Nguyen, P. and Tanh, H., "Interfacing Power Electronics to Modern Computers", Proceedings, 43rd IEE International Conference on Electrical Engineering, Seattle, USA, 1989, Pages 231-234.

Grammatical Tense

Most thesis authors experience major difficulties with tense in their documents. Many theses become a muddled mixture of past, present and future tense. To alleviate this problem, a simple solution is to treat the thesis as a historical document which will be read many years from the date of publication. The following grammatical procedure can then be adopted:

(i) All general discussions and all discussions of experiments, equipment, etc. are written in the past tense (e.g., "*The test-tubes were acquired from a standard batch that was available at the time of experimentation...*")

(ii) References to mathematical formulae are written in the present tense (e.g., "*Equation 7.2 highlights the relationship between...*").

(iii) References to objects (sections, tables, diagrams, etc.) in the thesis are in the present tense (e.g., "*Section 2.9 contains a discussion on...*")

(iv) References to future work are also written in the past tense (e.g., "*It was determined that future developments could lead to an increase in...*")

Many authors are concerned about writing in the past tense but they need not be. The fact that something is written in the past tense does not mean that it no longer exists - only that it existed as a matter of historical record at the time of research.

Unless one is highly skilled in English grammar, it is unwise to attempt to write a thesis in the present tense. The outcome of such a direction is that complex conflicts arise between the movement from historical record to current events to future predictions.

ANNEX-1

The thesis titled .....

.....

Submitted by

Roll No.....

Session .....

has been accepted as satisfactory in partial fulfillment of the requirement for the degree of.....

on.....

BOARD OF EXAMINERS

1. (Signature) Chairman
   Name of the supervisor
   Designation & Address
2. (Signature) Member
   Name of the Internal Member
   Designation & Address
3. (Signature) Member
   Name of the Internal Member
   Designation & Address
4. (Signature) Member
   Name of the Head of Dept (Ex-officio)
   Designation & Address
5. (Signature) Member
   Name of the External Member (External)
   Designation & Address

APPENDIX - A

CANDIDATE'S DECLARATION

It is hereby declared that this thesis or any part of it has not been submitted elsewhere for the award of any degree or diploma.

Signature of the Candidate

_____

Name of the Candidate

APPENDIX - B

ACADEMIC FEES

University Registration Fee	Taka_____
Admission /Enrolment Fee	Taka_____
Course Registration Fee	Taka_____ per Credit hour with a maximum of Taka _____ per Semester. Payable in 2 installments.
Project Registration Fee	Taka_____ (on 1st project registration).
Fees for each additional copy of Transcript	Taka _____
Medical Fees	Taka _____ per semester
Caution Money at first enrolment	Taka _____
Library Caution Money	Taka _____

* Caution Money may be refunded if the student withdraws officially from the entire course including project or at the end of his academic program and the amount will be determined from the statement of clearance from all Departments/Institutes/Offices.