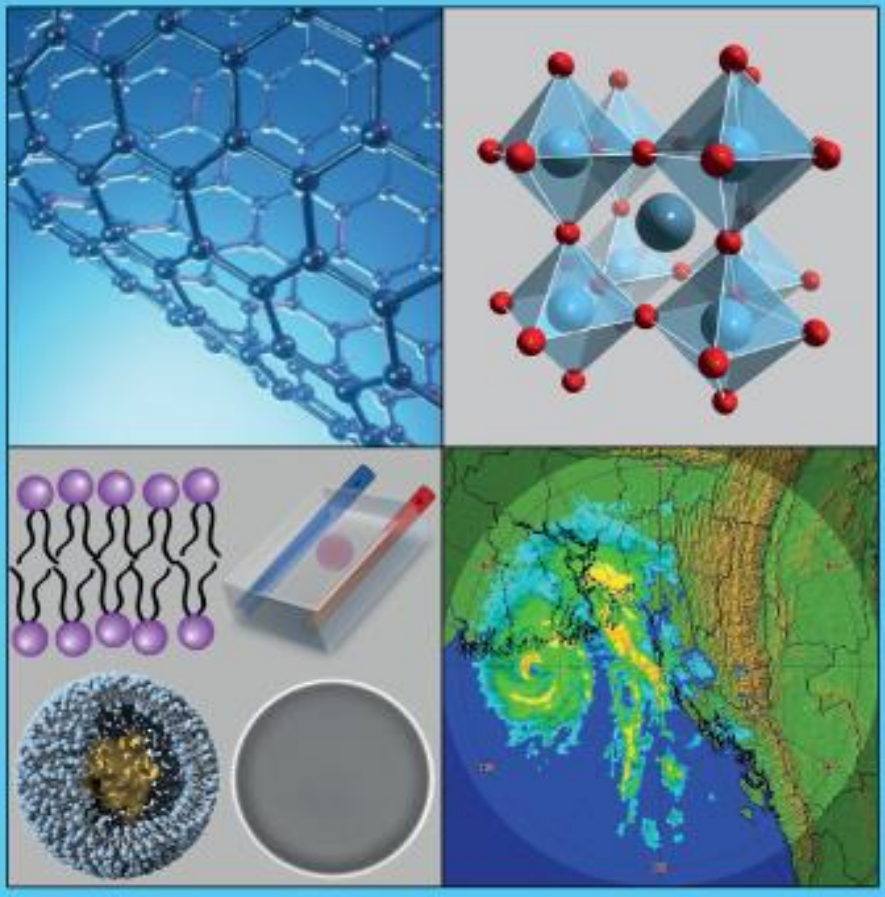
Prospectus

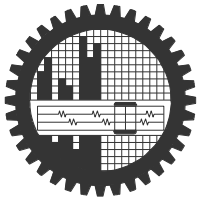


Department of Physics

Bangladesh University of Engineering and Technology

Prospectus of the Department of Physics

Undergraduate and Postgraduate Programs



BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

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PREFACE

This book titled “Prospectus of the Department of Physics” has been designed with six chapters to provide required information for the potential students of the undergraduate program in Engineering for studying Physics as a compulsory subject, and the postgraduate research in various fields offered by the Department of Physics, BUET. It is worth mentioning that the Department has a glorious background of excellence in Physics education for undergraduate students of engineering over seventy years, and in addition, it is providing quality education and advanced research in various fields of Physics for postgraduate students for about 40 years. The book encloses a thorough description of the inception of the University along with the Physics Department and incorporates course details offered to each program as well as pre-and post-entry requisites to the programs, discussed in its various chapters.

In this book, **Chapter 1** is dealt with a brief history of Bangladesh University of Engineering and Technology together with a succinct description of the Academic Programs, Faculties & Departments and University Administration. **Chapter 2** introduces the Department of Physics, its educational background and research interests along with the sequence of courses offering for the undergraduate and postgraduate programs. Syllabi for the undergraduate and postgraduate courses taught in the Department of Physics are prepared respectively by the Board of Undergraduate Studies (BUGS) and the Board of Postgraduate Studies (BPGS), incorporating suggestions and feedback obtained from the renowned physicists from home and abroad. This chapter also includes the research areas, existing research facilities, library facilities, information about BUET Physics Bulletin and Alumni of the Department. **Chapters 3, 4 and 5** describe the ordinance for the M. Sc., M. Phil. and Ph. D. Degree Programs in Physics, respectively.

Chapter 6 embraces the general guideline for thesis writing and the procedure of oral presentation for the defense.

Therefore, this book will be beneficial for both the undergraduate and postgraduate students, because it contains the details of the syllabus of the courses they are entrusted with and the prescribed terms and conditions of the study programs that are offered to make them curious and conscious to opt the courses.

I will acknowledge wholeheartedly and thank duly my colleagues who have helped me in various ways to prepare this booklet. Finally, my sincere apology if there is any mistake in this book even though utmost efforts have been given to prevent errors.

Dhaka
November, 2021

Head
Department of Physics

CONTENTS

CHAPTER 1

GENERAL INFORMATION

1.1 History of Bangladesh University of Engineering and Technology

Bangladesh University of Engineering and Technology (BUET) is one of the most prestigious institutions for higher studies in the country. It is a public engineering university in Bangladesh. In this university, about seven thousand students are pursuing undergraduate and postgraduate studies in the disciplines of engineering, architecture, planning and sciences. At present, BUET has eighteen departments under five faculties, six institutes, eight centers and four directorates. About 639 highly qualified teachers are working in this university. There are some prestigious positions like Professor Emeritus, Dr. Rashid Chair and Supernumerary Professors in this university. Excellent academic environment, state-of-the-art research facilities, and vibrant campus life have made this institution highly desirable for scientists, engineers, and architects. Students are enrolled in BUET through a highly competitive entrance examination. In every year, there is an intake of 1275 undergraduate students in Bachelor of Science in Engineering (B. Sc. Engg.), Bachelor of Architecture (B. Arch.), Bachelor of Urban and Regional Planning (BURP), and around 1000 postgraduate students in Master of Science (M. Sc.)/Master of Science in Engineering (M. Sc. Engg.)/Master of Engineering (M. Engg.), Master of Philosophy (M. Phil.), Master in Architecture (M. Arch.), Master in Urban and Regional Planning (MURP) and Doctor of Philosophy (Ph. D.) programs. This university is the technological research and innovation hub in Bangladesh. It has been contributing immensely to nation building since its establishment by providing expert services to hallmark infrastructure

development projects. Faculty members work closely with industry and the Government to address crucial problems and formulate policies and strategies in various sectors. This university is an active member of the Association of Commonwealth Universities and maintains strong collaborations with hundreds of renowned universities and industries at home and abroad. The rigorous and up-to-date academic programs prepare the students for the demand and opportunities of the new century and empower them to become innovators and leaders. It challenges them academically to maximize their potential and helps them to become top professionals in their respective fields.

Vision

To be a premier technical university locally and globally for providing education, performing research and innovation in Science, Engineering and Technology.

Mission

- To provide high-quality education, research and training in traditional and emerging Engineering fields.
- To produce high-quality Scientists, Engineers, Architects and Planners with high moral and ethical values for home and abroad.
- To enhance collaboration between academia and industry.
- To contribute to the national policy-making in the area of Engineering and Technology leading to the socio-economic development of Bangladesh.

The university campus is situated in the heart of Dhaka - the capital city of Bangladesh. The coordinates of BUET are latitude: 23° 43' 37.19" N and longitude: 90° 23' 34.29" E. It has a compact campus of 83.9-acre land with residences for students and employees. There are eight residential halls for students of which six are for undergraduate male students, two for female students and one for male postgraduate

students. This university is the oldest institution for the study of Engineering and Architecture in Bangladesh. The history of this institution dates back to the days of the Dhaka Survey School, which was established at Nalgola, in Old Dhaka in 1876 to train Surveyors for the then Government of Bengal of British India. In 1908, the Survey School became the Ahsanullah School of Engineering, offering three-year diploma courses in Civil, Electrical and Mechanical Engineering. In recognition of the generous financial contribution from the then Nawab of Dhaka, it was named after his father Khawja Ahsanullah. It moved to its present premises in 1912. In 1947, the school was upgraded to Ahsanullah Engineering College as a Faculty of Engineering under the University of Dhaka, offering four-year bachelor's courses in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. In order to create facilities for postgraduate studies and research, Ahsanullah Engineering College was upgraded to the status of a University in 1962 and was named East Pakistan University of Engineering and Technology. After the war of liberation in 1971, Bangladesh became an independent state, and the university was renamed as the Bangladesh University of Engineering and Technology. Till today, it has produced a large number of graduates in different branches of Engineering and Architecture and established a good reputation all over the world for the quality of its graduates, many of whom have excelled in their profession in different parts of the globe. The prevailing reputation of this university enabled to attract students from countries like India, Nepal, Iran, Jordan, Malaysia, Sri Lanka, Pakistan and Palestine.

At present, both undergraduate and postgraduate studies as well as research work have now become important issues among the primary functions of the university. Eighteen departments under five faculties offer B. Sc. Eng., B. Arch. and BURP degrees. Most of the departments under four faculties offer M. Sc., M. Sc. Engg., M. Engg., and M. Phil. degrees. M. Arch. and MURP degrees are offered by the Faculty of Architecture and Planning. Almost all departments under these faculties

also offer Ph. D. programs. In addition to its own research programs, the university undertakes research programs sponsored by different organizations like University Grants Commission, European Union, UNO, Commonwealth, etc. The expertise of the teachers and the laboratory facilities are duly utilized to solve problems of academic courses, research work, and disseminate up-to-date knowledge in science, engineering and technology.

1.2 University Administration

i) The Chancellor of the University: Hon'able President of the People's Republic of Bangladesh
ii) The Vice-Chancellor
iii) The Pro-Vice-Chancellor
iv) The University Syndicate
v) Deans of the Faculties
vi) Heads of the Departments
vii) Directors of Institutes, Centers and Others
viii) Provosts of Residential Halls
ix) Administrative Officers
x) Advisers to Vice-Chancellor
xi) Statutory Authorities

The Statutory Authorities are as follows:

- Academic Council
- Finance Committee
- Faculties
- Selection Boards
- Committee for Advanced Studies and Research (CASR)
- Planning and Development Committee
- Boards of Undergraduate Studies (BUGS)
- Boards of Postgraduate Studies (BPGS)

The syndicate is the supreme authority in major policy-making matters and in approving recommendations of relevant issues. The finance committee, the planning and development committee and other committees assist the Syndicate in matters important for proper functioning of the university. The academic council is the supreme body for formulating academic rules and regulations on the recommendation of BUGS, BPGS, Faculties and CASR.

1.3 Faculties, Departments, Institutes, Centers and Directorates

BUET is the leading technical university in Bangladesh with strong and diverse research and teaching programs in the departments under five faculties. Undergraduate programs in the Faculty of Engineering, Civil Engineering, Electrical and Electronic Engineering, and Mechanical Engineering extend over four years and lead to B. Sc. Engg. degrees. On the other hand, in the Faculty of Architecture and Planning, the degree of B. Arch. is obtained in five years and the degree of BURP in four years. All the departments, except the Department of Humanities, have postgraduate programs. The eighteen departments belonging to the five faculties are as follows:

Faculty of Engineering

- Department of Chemical Engineering
- Department of Materials & Metallurgical Engineering
- Department of Chemistry
- Department of Mathematics
- Department of Physics
- Department of Petroleum and Mineral Resources Engineering
- Department of Glass and Ceramic Engineering

Faculty of Civil Engineering

- Department. of Civil Engineering
- Department of Water Resources Engineering

Faculty of Electrical and Electronic Engineering

- Department of Electrical and Electronic Engineering
- Department of Computer Science and Engineering
- Department of Biomedical Engineering

Faculty of Mechanical Engineering

- Department of Mechanical Engineering
- Department of Naval Architecture & Marine Engineering
- Department of Industrial and Production Engineering

Faculty of Architecture and Planning

- Department of Architecture
- Department of Urban and Regional Planning
- Department of Humanities

Institutes

- Institute of Water and Flood Management (IWFM)
- Institute of Appropriate Technology (IAT)
- Institute of Information & Communication Technology (IICT)
- Accident Research Institute (ARI)
- BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS)
- Institute of Nuclear Power Engineering (INPE)

Directorates

- Directorate of Advisory, Extension and Research Services (DAERS)
- Directorate of Students' Welfare (DSW)
- Directorate of Planning and Development (P&D)
- Directorate of Continuing Education (DCE)

Research Centers

- Centre for Energy Studies (CES)
- Centre for Environmental and Resource Management (CERM)
- Bureau of Research, Testing and Consultation (BRTC)
- International Training Network Centre (ITN)
- Bangladesh Network Office for Urban Safety (BNUS)
- Centre for Regional Development Studies (CRDS)
- Institutional Quality Assurance Cell (IQAC)
- Research and Innovation Center for Science and Engineering (RISE)

1.4 Academic Programs

The departments and institutes of the university are responsible for the academic activities, which include teaching, research and industrial consultancy. The university has introduced the course system for undergraduate studies from the academic session 1990-1991, commencing from October, 1992. Under this system, there are two terms (January and July) in an academic year. Each term provides for a minimum of 14 (fourteen) teaching weeks. The medium of instruction is in English. Students are evaluated on a continuous basis throughout the term. At present, postgraduate studies and research are the primary functions of the university. Currently, each academic year in postgraduate studies is divided into two semesters: April semester and

October semester. For theory courses, the number of class-weeks in a semester is fourteen. Research work is evaluated on the basis of the proposal of thesis/project as reviewed by peer examiners both from within the university and outside the university. The teachers of the departments and institutes meet periodically to review the courses and their contents; necessary changes of these courses are made from time to time to meet the needs and trends for excellence in education. Course syllabi and ordinances in respect of the academic program of study are approved by the Academic Council, the highest academic body within the university.

CHAPTER 2

DEPARTMENT OF PHYSICS

2.1 Introduction

Department of Physics, BUET has started functioning as a full-fledged department since the inception of the university in 1962. The department has been offering Physics courses to undergraduate Engineering and Architecture students. Adequate laboratory facilities are available to supplement the theoretical knowledge and to provide an experimental basis. The department has introduced postgraduate programs (M. Phil. and Ph. D.) in the year 1982, and M. Sc. in the year 2015. The research is conducted in the fields of Solid State Physics, Biophysics and Medical Physics, and Atmospheric Physics. At present, the department has 19 faculty members and 10 technical personnel and office staff. So far more than 50 Ph. D., 250 M. Phil. and 60 M. Sc. students have received their degrees from this department. The departmental offices and laboratories are housed in the Old Academic Building (OAB).

2.2 Faculty Members

Sl. No.	Name of the Teachers	Research Field
1.	Dr. Jiban Podder Professor jpodder@phy.buet.ac.bd	Crystal Growth; Carbonaceous Materials; Oxides thin films for sensor and optoelectronic applications
2.	Dr. Md. Feroz Alam Khan Professor fakhan@phy.buet.ac.bd	Magnetism and Magnetic Materials
3.	Dr. A. K. M. Akther Hossain Professor akmhossain@phy.buet.ac.bd	Multiferroic Composites, Metal Halides, Superconductivity, Nanocrystalline Ferrites

Sl. No.	Name of the Teachers	Research Field
4.	Dr. Md. Mostak Hossain Professor mhossain@phy.buet.ac.bd	Crystal Growth Processes
5.	Dr. Afia Begum Professor apelie@phy.buet.ac.bd	Medical Physics
6.	Dr. Md. Forhad Mina Professor mfmina@phy.buet.ac.bd	Polymer Crystallization, Blends, Composites and Hydrogels
7.	Dr. Md. Rafi Uddin Professor rafiuddin@phy.buet.ac.bd	Monsoon and Mesoscale Meteorology, Radar Meteorology, Numerical Modeling, Lightning and Climate Change
8.	Dr. Nasreen Akter Professor nasreenakter@phy.buet.ac.bd	Tropical Cyclone, Monsoon and Mesoscale Meteorology, Aerosol and Numerical Modeling
9.	Dr. Mohammed Abdul Basith Professor mabasith@phy.buet.ac.bd	Multiferroics, Magnetic Nanoparticles, Halide Perovskites, Photocatalysis, Solar Hydrogen Evolution
10.	Dr. Mohammad Abu Sayem Karal Professor asayem221@phy.buet.ac.bd	Biophysics, Static and Dynamic functions of membranes, Medical Physics
11.	Dr. Mohammad Jellur Rahman Professor mjrahman@phy.buet.ac.bd	Plasma Processing of Polymer Thin Films, Carbon Nanomaterials, Nanocomposites of Biopolymers
12.	Dr. Muhammad Samir Ullah Associate Professor samirullah@phy.buet.ac.bd	Magnetic materials (Ferrites), Multiferroics, Thin Films, Biomaterials and Nonlinear Optical Materials
13.	Dr. Muhammad Rakibul Islam Associate Professor rakibul@phy.buet.ac.bd	Nanostructured Materials, Bio-polymer Based Nanocomposite for Energy Storage, Thin Film
14.	Dr. Mohammad Khurshed Alam Associate Professor khurshedphy@phy.buet.ac.bd	Nano-biomaterials, Magnetic materials

Sl. No.	Name of the Teachers	Research Field
15.	Dr. Mehnaz Sharmin Associate Professor mehnaz@phy.buet.ac.bd	Semiconductors, Metal Oxides, Thin Films for Sensor and Optoelectronic Applications
16.	Dr. Parvin Sultana Associate Professor psmony@phy.buet.ac.bd	Optoelectronics, Nanomaterials, Thin Films
17.	Dr. Md. Azizar Rahman Assistant Professor azizar@phy.buet.ac.bd	Semiconductors, Magnetic materials, Optoelectronics
18.	Mr. A.T.M. Shafiul Azam Assistant Professor atmshafi@phy.buet.ac.bd	Extreme Event, Lightning, Remote Sensing
19.	Mr. Md. Mehdi Masud Assistant Professor msakib@phy.buet.ac.bd (On study leave)	Plasma and Polymer Physics
20.	Ms. Amita Hossain Lecturer amita895@phy.buet.ac.bd	Materials Science, Condensed Matter Physics
21.	Mr. Probal Roy Lecturer probal@phy.buet.ac.bd	Materials Science including Bulk and Nanostructured Materials

2.3 Office/Laboratory Staff

Sl. No.	Name	Designation
1.	Md. Idris Munshi	Sr. Technical Officer
2.	Md. Lutfar Rahman Sarkar	Sr. Technical Officer
3.	Faria Noor	LDA Cum Computer Operator
4.	Swapan Kumar Das	Sr. Lab Attendant
5.	Md. Mozammel Hoque	Sr. Lab Attendant
6.	Md. Abu Taher	Sr. Lab Attendant
7.	Md. Lutfor Rahman	Sr. Lab Attendant

Sl. No.	Name	Designation
8.	Md. Nazmus Sakib	Sr. Lab Attendant
9.	Md. Atikuzzaman	Sr. Office Attendant
10.	Md. Monowar Hossain Khan	Sr. Office Attendant

2.4 Offered Academic Degrees

Department of Physics offers M. Sc., M. Phil., and Ph. D. programs. These programs are offered to the students with both theoretical courses and research work in various fields of Physics. These programs are designed with a view to open great opportunities to facilitate the students acquiring higher degrees to build up their skillful careers in the fields mentioned in section 2.1. Such programs will help the students to build up and develop their skills and capacities so that they can contribute to the development of the country.

2.5 Undergraduate Courses

Since the inception of BUET, the Department has been offering various Physics courses to the undergraduate students of Engineering and Architecture discipline.

2.5.1 List of Courses

Level 1/Term 1

PHY 101: Physical Optics, Waves & Oscillations and Heat & Thermodynamics (CE)

PHY 105: Structure of Matter, Electricity & Magnetism and Modern Physics (ME)

PHY 107: Physical Optics, Waves & Oscillations and Heat & Thermodynamics (WRE)

PHY 109: Heat & Thermodynamics, Electricity & Magnetism, Waves & Oscillations and Mechanics (CSE)

PHY 113: Structure of Matter, Electricity & Magnetism and Modern Physics (NAME)

PHY 115: Physics (Light, Heat and Sound) (Arch)

PHY 117: Structure of Matter, Electricity & Magnetism and Modern Physics (IPE)

PHY 121: Waves and Oscillations, Optics and Thermal Physics (EEE)

PHY 123: Waves and Oscillations, Optics and Thermal Physics (BME)

PHY 125: Physics I (MME)

PHY 127: Physical Optics, Waves & Oscillations and Modern Physics (ChE)

PHY 102: Physics Sessional

Level 1/Term 2

PHY 151: Structure of Matter, Electricity & Magnetism and Modern Physics (CE)

PHY 153: Structure of Matter, Electricity & Magnetism and Modern Physics (WRE)

PHY 159: Waves & Oscillation, Geometrical Optics and Wave Mechanics (ME)

PHY 161: Waves & Oscillation, Geometrical Optics and Wave Mechanics (NAME)

PHY 163: Waves & Oscillations, Physical Optics and Wave Mechanics (IPE)

PHY 165: Electricity & Magnetism, Modern Physics and Mechanics (EEE)

PHY 167: Electricity and Magnetism, Modern Physics and Mechanics (BME)

PHY 169: Physics II (MME)

PHY 171: Structure of Matter, Electricity & Magnetism and Nanophysics (ChE)

PHY 102: Physics Sessional

PHY 152: Physics Sessional

Level 2/Term 1

PHY 201: Physics III (MME)

Level 3/Term 1

PHY 305: Solid State Physics (ChE)

Level 4/Term 1

PHY 401: Solid State Physics (MME)

2.5.2 Course Details

Details of the individual courses comprising the following topics are also available in the website of the department.

Mechanics: Linear momentum of a particle, Linear momentum of a system of particles, Conservation of linear momentum, Some applications of the momentum principle; Angular momentum of a particle, Angular momentum of a system of particles, Kepler's Law of planetary motion, The Law of universal gravitation, The motion of planets and satellites, Introductory quantum mechanics; Wave function, Uncertainty principle, Postulates of Quantum Mechanics, Schrödinger time independent equation, Expectation value, Probability, Particle in a zero potential, Calculation of energy.

Properties of Matter: States of matter, Elastic properties of solids; Coefficients of elasticity, Energy calculation; Flow of liquids; Equation

of continuity, Laminar and turbulent flow, Reynolds number and its significance, Bernoulli's theorem and its application; Viscosity; Poiseuille's equation, Motion in a viscous medium, Determination of coefficient of viscosity; Surface tension; Surface tension as a molecular phenomenon, Surface tension and surface energy, Capillarity and angle of contact, Quincke's method.

Geometrical Optics: Combination of lenses: Equivalent lens and equivalent focal length, Cardinal points of a lens, Power of a lens; Defects of images: Spherical aberration, Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Optical instruments: Compound microscope, Polarizing microscope, Resolving power of a microscope, Camera and photographic techniques.

Physical Optics: Theories of light; Interference of light, Young's double slit experiment, Displacement of fringes and its uses, Fresnel Bi-prism, Interference at wedge shaped films, Newton's rings, Interferometers; Diffraction of light; Fresnel and Fraunhofer diffractions, Diffraction by single slit, Diffraction from a circular aperture, Resolving power of optical instruments, Diffraction at double slit and N-slits-diffraction grating; Polarization; Production and analysis of polarized light, Brewster's Law, Malus' Law, Polarization by double refraction, Retardation plates, Nicol prism, Optical activity, Polarimeters, Polaroid.

Waves & Oscillations: Differential equation of a Simple Harmonic Oscillator, total energy and average energy, Combination of simple harmonic oscillations, Lissajous' figures, spring- mass system, Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping co-efficient. Forced oscillation, Resonance, Two-body oscillations, Reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

Heat & Thermodynamics: Principle of temperature measurements: Platinum resistance thermometer, Thermo-electric thermometer, Pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular speeds, Mean free path, Equipartition of energy, Brownian motion, Van der Waal's equation of state, Review of the First Law of Thermodynamics and its application, Reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's theorem, Entropy and disorder, Thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule, Third Law of Thermodynamics.

Structure of Matter: Crystalline and non-crystalline solids, Single crystal and polycrystal solids, Unit cell, Crystal systems, Co-ordinations number, Crystal planes and directions, NaCl and CsCl structure, Packing factor, Miller indices, Relation between interplanar spacing and Miller indices, Bragg's Law, Methods of determination of interplanar spacing from diffraction patterns; Defects in solids: Point defects, Line defects; Bonds in solids, Interatomic distances, Calculation of cohesive and bonding energy; Introduction to band theory: Distinction between metal, semiconductor and insulator.

Electricity and Magnetism: Coulomb's Law, Electric field, Gauss's Law and its application, Electric potential, Capacitors and capacitance, Capacitors with dielectrics, Dielectrics an atomic view, Charging and discharging of a capacitor, Ohm's Law, Kirchhoff's Law; Magnetic field: Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faradays Law of electromagnetic induction, Lenz's Law, Self-induction, Mutual induction; Magnetic properties of matter; Hysteresis curve; Electromagnetic oscillation: L-C oscillations and its analogy to simple harmonic motion.

Modern Physics: Michelson-Morley's experiment, Galilean transformation, Special theory of relativity and its consequences; Quantum theory of radiation; Photo-electric effect, Compton effect, Wave particle duality, Interpretation of Bohr's postulates, Radioactive disintegration, Properties of nucleus, Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor.

Waves Mechanics/Quantum Mechanics: Principles of statistical physics, Probabilities, Classical statistics; Quantum statistics; Bose-Einstein statistics, Fermi-Dirac statistics and their applications; Fundamental postulates of wave mechanics, Time dependent Schrodinger equation, Schrodinger equation for one-electron atom and its solution.

Nanomaterials: Concepts of nanomaterials, Synthesis and characterization of nanomaterials, Applications of nanostructured materials, Production, characterization and applications of thin film, Defects in thin films, Electron transport and optical properties of thin films.

Solid State Physics: Classical free electron theory, Fermi surface, Fermi energy, Density of states, Electron in a periodic potential, Kronig-Penney model, Band structure calculations, Clausius-Mosotti relation, Polarization mechanisms, Direct and indirect band gap semiconductors, Extrinsic semiconductors, Transport, optical and photoelectrical phenomena in semiconductors, Metal-semiconductor junction, Theories of superconductor, Mechanism of superconductivity, Theories of magnetism, Types of magnetic materials, Practical applications of solid state physics.

2.6 Undergraduate Laboratory

Besides the theory courses, adequate laboratory facilities are available to supplement the theoretical knowledge and to provide experimental basis of the students for enhancing their capabilities in engineering education.

The available laboratory facilities are listed below:

1. Determination of the frequency of a tuning fork by Melde's apparatus.
2. Determination of the spring constant and the effective mass of a loaded spring.
3. Determination of the acceleration due to gravity 'g' by means of a compound pendulum.
4. Determination of the surface tension of water by capillary tube method.
5. Determination of the moment of inertia of a flywheel about its axis of rotation.
6. Determination of the rigidity modulus of the material of a wire by the static method.
7. Determination of the Young's modulus of the material of a wire by Searle's apparatus.
8. Determination of the specific heat of a liquid by the method of cooling.
9. Determination of the pressure-coefficient of air by a constant volume air thermometer.
10. Determination of thermal conductivity of a good conductor by Searle's apparatus.
11. Determination of the thermal conductivity of a bad conductor by Lee's method
12. To plot the thermo-electromotive force vs. temperature (calibration) curve for a given thermocouple. Determination of the melting point of a solid using this calibration curve.
13. Determination of the mechanical equivalent of heat by the electrical method.
14. Determination of the focal length of (I) a convex lens by the displacement method and (ii) a concave lens by the auxiliary lens method.

15. Determination of the refractive index of a liquid by plane mirror and pin method using a convex lens.
16. Determination of the refractive index of the material of a prism with the help of a spectrometer.
17. Determination of the radius of curvature of a Plano-convex lens by the Newton's ring method.
18. Determination of the specific rotation of sugar solution by a polarimeter.
19. Determination of the threshold frequency for the material of a photocathode and hence find the value of the Planck's constant.
20. Determination of the linear absorption coefficient and mass absorption coefficient of Aluminum using a ^{137}Cs radioactive source, and verification of the inverse square law of gamma radiation.
21. Determination of unknown resistances and verification of the laws of resistances by P.O. (Post Office) Box
22. Determination of the resistance of a galvanometer by half deflection method.
23. To verify Biot-Savart law and Tangent law.
24. Determination of the temperature coefficient of the resistance of the material of a wire.
25. Verification of Heisenberg's uncertainty principle using a single slit diffraction pattern.
26. Determination of the moment of inertia of a point mass and verification of conservation of angular momentum.
27. Determination of dielectric constant of materials using a parallel plate capacitor.
28. Determination of the intensity distribution of the Fraunhofer diffraction pattern due to double slit.

2.7 Postgraduate Courses

The postgraduate programs are mainly devised and initiated, keeping in mind to teach the students fundamental, applied and advanced courses in different areas of Physics and to create new avenues to basic and applied as well as advanced research. Both the syllabi of the courses and the quality of research work are designed so to suffice for maintaining international standards, contemplating with a view to open great opportunities for the students, who desire to acquire higher degrees for building up their skillful careers, in the various fields of Physics.

2.7.1 List of Courses

A: Solid State Physics

PHY 6001: Quantum Mechanics
PHY 6002: Low Temperature Physics and Vacuum Techniques
PHY 6003: Physics of Semiconductors and Superconductors
PHY 6005: Solid State Physics
PHY 6007: Optical Crystallography
PHY 6008: Fundamental of Magnetism
PHY 6010: Physics of Deformed Solids
PHY 6011: Thermodynamics of Solids
PHY 6013: Physics of Non-Crystalline Solids
PHY 6014: Solid State Plasma
PHY 6015: Neutron Scattering
PHY 6017: Nanophysics
PHY 6018: Materials Science
PHY 6021: Polymer Physics
PHY 6022: Physics of X-ray
PHY 6023: Advanced Magnetism
PHY 6024: Experimental Techniques in Solid State Physics
PHY 6025: Crystal Growth processes

B: Biophysics and Medical Physics

PHY 6102:	Nuclear Reaction
PHY 6103:	Nuclear Model
PHY 6104:	Physics of Radiology
PHY 6105:	Health Physics
PHY 6106:	Radiation Biophysics
PHY 6107:	Physics of Radiotherapy
PHY 6109:	Reactor Physics
PHY 6110:	Radiation Protection
PHY 6111:	Basic Anatomy and Physiology
PHY 6113:	Advanced Nuclear Physics
PHY 6114:	Medical Physics

C: Atmospheric Physics

PHY 6204:	Remote Sensing and GIS
PHY 6205:	Climatology I
PHY 6206:	Climatology II
PHY 6207:	Radar Meteorology
PHY 6208:	Atmospheric Modeling and Data Assimilation
PHY 6211:	Atmospheric Physics
PHY 6212:	Dynamical Meteorology
PHY 6213:	Tropical Meteorology

PHY 6001, PHY 6005, PHY 6113 and PHY 6211 are the compulsory courses for M. Sc. students approved by the 467th academic council dated on 13 July 2021.

2.7.2 Course Details

A: Courses in Solid State Physics

PHY 6001: Quantum Mechanics

Schrödinger wave equation : One dimensional problem, particle in a box, tunnelling through a potential barrier, linear harmonic oscillator, K-P model; Particle in a central potential: Hydrogen atom; WKB approximation method; Perturbation theory for degenerate & non-degenerate cases: First and second order perturbation, applications-Zeeman effect & Stark effect; Time dependent perturbation theory; Variation method: Application to The atom & van der Waals interaction between two hydrogen atoms; Spin Pauli spin matrices; Dirac equation: System of identical particles; many electron system; Hatree-Fock approximation.

PHY 6002: Low Temperature Physics and Vacuum Techniques

Production of low temperature; Thermodynamics of liquefaction; Joule-Thompson liquefiers; Cryogenic system design: Cryostat design, heat transfer, temperature control, adiabatic demagnetization; Different types of pumps: rotary, diffusion and ion pumps, pumping speeds, conductance & molecular flow; Vacuum gauges: Mclead gauge, thermal conductivity ionization gauges; Cryogenic thermometry: gas &vapour pressure thermometers, resistance, semiconductor and diode capacitance thermometers, thermocouples, magnetic thermometry.

PHY 6003: Physics of Semiconductors and Superconductors

Intrinsic, extrinsic, and degenerate semiconductors; Density of states in a magnetic field; Transport properties of semiconductors; thermo-electric effect, thermomagnetic effect, Piezo-electric resistance, high frequency conductivity; contact phenomena in semiconductors: metal-semiconductor contacts, p-n junction, etc. Optical and photoelectrical phenomena in semiconductors: light absorption by free charge, charge

carriers, lattices, and electrons in a localized state, photoresistive effect, Dember effect, photovoltaic effect, Faraday effect, etc.

Phenomena of superconductivity: Pippard's non-local electrodynamics, thermodynamics of superconducting phase transition; Ginzburg-Landau theory; Type-I and type-II superconductors, Cooper pairs; BCS theory; Hubbard model, RVB theory, Ceramic superconductors: synthesis, composition, structures; Thermal and transport properties: Normal state transport properties, specific heat; role of phonon, interplay between magnetism and superconductivity: Possible mechanism other than electron-phonon interaction for superconductivity.

PHY 6004: Polymer Physics

Macromolecular physics: Chemical structure of polymers; Internal rotations; Configurations, conformations, and flexibility of macromolecules. Morphology of polymers: Modern concepts of polymer structure; Crystalline, amorphous polymers. Physical states of polymers: Rubbery state, glassy state, oriented state. Rheology and mechanical properties of polymers. Electrical properties of polymers: Electrical transport theory; Dielectric properties of crystalline and amorphous polymers; Conducting polymers. Polymer processing: Plasma polymerization; polymer crystallization; Plastic, fiber, elastomer, and composite technologies. Experimental methods for determination of polymer properties.

PHY 6005: Solid State Physics

Lattice dynamics of one, two & three dimensional lattices, specific heat, elastic constants, phonon dispersion relations, localized modes; Dielectric and optical properties of insulators: a.c. conductivity dielectric constant, dielectric losses; Transport theory: Free electron theory of solids: density of states, Fermi sphere, Electrons in a periodic potential; Band theory of solids: Nearly free electron theory, tight binding approximation, Brillouin zones, effective mass of electrons and holes.

PHY 6007: Optical Crystallography

The morphology of crystals, the optical properties of crystals, the polarizing microscopy, general concept of indicatrix, isotropic and uni-axial indicatrix, orthoscopic and conscopic observation of interference effects, orthoscopic and conscopic examination of crystals. Optical examination of uni-axial and bi-axial crystals, determination of retardation and birefringence, extinction angles, absorption and pleochroism, determination of optical crystallographic properties.

PHY 6010: Physics of Deformed Solids

Theory of matter transport by defect mechanism: Random walk theory and correlation effects in metals and alloys for impurity and self-diffusion: Theory of ionic transport process, impurity defect association, long range interactions, dielectric loss due to defect dipoles, Internal friction, Radiation damage in metals and semiconductors, colour centres: mechanism of production by various methods, Optical and magnetic properties and models of different colour centre; Theoretical calculation of atomic displacement and energies in defect lattices and amorphous solids, stress-strain and dislocations; Elasticity theory of stress field around edge and screw dislocations, Dislocation interactions and reactions effects on mechanical properties.

PHY 6011: Thermodynamics of Solids

Properties at 0 K, Grüneisen relation, Heat capacities of crystals, specific heat arising from disorder. Rate of approach of equality, Variation of compressibility with temperature, Relation between thermal expansion and change of compressibility with pressure. Thermodynamics of phase transformation and chemical reactions. Thermodynamic properties of alloy system: Factors determining the crystal structure; The Hume-Rothery rule, the size of ions; Equilibrium between phases of variable composition, Free energy of binary systems; Thermodynamics of surface and interfaces, Thermodynamics of defects in solids.

PHY 6012: Experimental Techniques in Solid State Physics

Sample preparation techniques: Powder, bulk and films; Heat treatments; Lithography. Thermal analyses: Differential thermal and thermogravimetric analysis; Differential scanning calorimetry. Optical spectroscopy; Raman spectroscopy; Electron microscopy; X-ray photo electron spectroscopy; X-ray diffractometry. Electrical transport properties measurements: Resistivity, impedance, conductivity; Dielectric constant and loss factor. Magnetic measurement methods: VSM; SQUID; AC susceptometer; Magnetic domain observation technique; Electron spin resonance; Ferromagnetic resonance; Nuclear magnetic resonance.

PHY 6013: Physics of Non-Crystalline Solids

Types of disorder, amorphous and glassy solids: formation of amorphous solids, The glass transition theories, Morphology- the primacy of short range order, Experimental techniques for structure determination; Electronic structure of amorphous solids; Concept of tail states, gap states and mobility gap, electronic density of states and their determination; Optical and electrical properties of amorphous solids; Applications in photovoltaics, optical memories, optical communication xerography etc. Thin films, Deposition process; Growth of thin films: Kinetics of nucleation, mechanism of growth, etc.; Defects in thin films; Electron transport in thin films: size effect, galvanomagnetic effects; Optical properties of thin films: thin film filters, laser mirrors; Optical memory, etc.

PHY 6014: Solid State Plasma

Basic principle: Introduction, Debye shielding, plasma parameters, collisions, Vlasov equation, fluid equations MHD theory, Plasma in Semiconductor: Dispersion equation, drift current of charged particles, Boltzmann Kinetic equation, effective mass and band structure, Scattering mechanisms & relaxation time. Electron plasmas in metals: Fermi distribution and Hatree-Fock exchange energy,

dielectric response function, random phase approximation, local field corrections & ground state energy, Electromagnetic wave in magnetized plasma: Helicon and Alfve n-wave experiments in solid state plasma, propagation of electromagnetic waves, uncompensated plasmas, compensated two component plasma; Nonlinear effects: Trapped particles, amplitude oscillations, ion-acoustic wave solutions, ponderomotive force.

PHY 6015: Neutron Scattering

Neutron sources, continuous and pulsed sources, monochromatization, collimation and moderation of neutrons, neutron detectors, scattering of neutrons and its advantages, elastic scattering of neutrons, magnetic scattering and determination of magnetic structure, inelastic scattering, thermal vibration of crystal lattices, lattice dynamics and phonons. Neutron polarization, polarized neutron applications, scattering by liquids and molecules, Van-Hovev correlation formalism, some experimental results of scattering by liquids and molecules, small angle neutron scattering and its application in the study of biological molecules and defects. Experimental techniques of scattering measurements, Time-of-Flight method, crystal diffraction techniques, neutron diffractometer and triple-axis spectrometer, constant 'Q' method.

PHY 6017: Nanophysics

Growth of nanoscale systems and their lithography, Quantum mechanical effects of nanostructures and their impacts, Two-dimensional electron gas, Quantum dots and wires, Graphene, Carbon nanotubes, Superlattices, Magnetic nanostructures, Quantum Hall effect, Coulomb blockade effect, Aharonov-Bohm effect, Conductance quantization, Weak and strong localization, Resonant tunneling, Modification of materials properties at nanoscale using high energy electrons and ions, Importance and applications of nanostructured

materials, Latest and future nanoscience and nanotechnological advances and challenges.

PHY 6018: Materials Science

Classification of materials; Crystalline and amorphous materials; Metallic, semiconducting, insulating, dielectric, piezoelectric, ferroelectric and pyroelectric materials; Properties of metals and non-metals; Diffusion mechanisms: diffusion in superionic conductors, high temperature superconducting ceramics and amorphous materials; Electrical properties of alloys, ceramics and polymers; Magnetic properties of magnetoresistive, magnetocaloric and other advanced magnetic materials; Application of advanced materials; Materials of the future.

PHY 6021: Magnetism

Classification of magnetic materials; Quantum theory of paramagnetism; Pauli paramagnetism; Properties of magnetically ordered solids; Weiss theory of ferromagnetism; Law of approach of saturation; Interpretation of exchange interaction in solids; Ferromagnetic domains; Techniques of magnetization; Intrinsic magnetization of alloys; Theory of antiferromagnetic and ferrimagnetic ordering; Ferrimagnetic oxides and compounds.

PHY 6022: Physics of X-ray

Properties, production, filtration and detection of X-ray; Reciprocal lattice; Structure factor. X-ray diffraction: X-ray diffraction from an electron, an atom, a molecule and a crystal. X-ray diffraction techniques: Laue method, powder method, rotating crystal method, wide-angle and small-angle X-ray diffraction. Factors affecting X-ray intensities: Multiplicity factor, Lorentz factor, absorption factor, and temperature factor. Analysis of polycrystalline structure: Aggregates**,** grain size, particle size, crystal perfection, crystal orientation; Analysis of fibre textured crystal; X-ray absorption; X-ray imaging.

PHY 6023: Advanced Magnetism

Magnetic anisotropy; Magnetoresistance; Different types of magnetostriction; Magnetocaloric effect; Magneto-optic Kerr effect; Neutron scattering; Mossbauer spectroscopy; Domain wall energy; Structure of domain wall; Technological applications of magnetic materials.

PHY 6025: Crystal Growth Processes

Crystal growth techniques: Growth from solution, melt and vapour phases; Metal organic chemical vapour deposition; Molecular beam epitaxy and related techniques; Solubility diagram; Seed preparation. Theories of growth phenomena: Gibbs free energy diagram; Classical theory of nucleation; Defects and dislocation; Equilibrium/non-equilibrium distribution of impurities; Surface roughness; Diffusion and adsorption layer theory; The Kossel-Stranski-Volmer theory; The Burton-Cabera-Frank theory; Periodic bond chain theory. Potential applications: Ferroelectric, piezoelectric, ultraviolet and infrared crystals; Organic, inorganic, semi-organic, acoustics and photonic crystals; Nonlinear optical crystals and their applications; Liquid crystals.

B: Courses in Biophysics and Medical Physics

PHY 6102: Nuclear Reaction

Compound nucleus, Statistical theory, Breit-Wigner dispersion formula, Level density, Angular distribution, Energy spectra, Resonance, Giant-resonance, Isobaric-spin, Isobaric analogue states, Analogue resonance, Direct reaction, Inelastic scattering, Stripping and pick-up reaction, Butler's theory, DWBA theory, Assignment of J-values of nuclear levels.

PHY 6103: Nuclear Model

Shell mode, Infinite square well potential, Harmonic oscillator potential, Spin orbit potential, Single particle model, Independent particle model, L-S and j-j coupling, Transformation between L-S and j-j coupling, collective model, Liquid drop model, Models of even-even nuclei, Optical model, Kapur-Peierls dispersion formula.

PHY 6104: Physics of Radiology

The production and properties of X-ray, diagnostic and therapy x-ray tubes, x-ray circuit with rectification, Electron interaction, characteristic radiation, Bremsstrahlung, Angular distribution of x-rays, Quality of x-rays, Beam restricting devices, The grid, Radiographic film, Radiographic quality, Factors affecting the image, Image modification, Image intensification, contrast media, Modulation transfer function, Exposure in diagnostic radiology, Fluoroscopy, computed tomography, Ultrasound, Magnetic resonance imaging.

PHY 6105: Health Physics

Atomic and nuclear structure, Isotopes, Binding energy and nuclear stability, Radio-activity, Specific activity, Alpha rays, Beta rays, Gamma rays, Interaction of different radiations with matter, Radiation dosimetry, Absorbed dose, Exposure, Exposure measurements, Bragg-Gray principle, Kerma, Stopping-power ratio, Energy fluence and exposure, Internally deposited radioisotopes, Effective half-life, Does commitment, MIRD method, Measurement of absorbed does, Film badges, Pocket dosimeter, Fricke dosimeter, Calorimetric method, Thermoluminescent dosimeter (TLD).

PHY 6106: Radiation Biophysics

The nucleus, Ionizing radiations, Radiation doses, Interaction of radiation with matter, Cell structure, Radiation effects on independent cell systems, Oxygen effect, Hyperthermia, LET and RBE, Lethal,

potentially lethal and sub-lethal radiation damage, Dose-rate effect, Acute effects of radiation, Somatic effects, Late effects, Non-specific life shortening and carcinogenesis, Genetic changes, Nominal standard dose (NSD), Time dose fractionation (TDF), Standquist curve.

PHY 6107: Physics of Radiotherapy

Introduction, superficial and deep x-ray machines, teletherapy, linear accelerator, radiation fields within a patient, single isodose curve, multiple-field isodose curve patterns, percentage depth dose (PDD), back-scattering factor (BSF), electron therapy, tissue air ratio (TAR), tissue maximum ratio (TMR), treatment planning.

PHY 6108: Medical Physics

Structure and behavior of macromolecules; Structure determination techniques; Properties and structure of nucleic acid; Basic membrane properties, membrane model, vesicles; Physics of nervous and cardio-vascular systems. Ultrasound imaging; Gamma camera; CT scanner; Audiology; Vascular measurements. Cardiac measurements: ECG; Heart disorders; Defibrillators; Pacemakers. Neuromuscular measurements: EEG; EMG; Stimulation of neural tissue; Nerve conduction measurements.

PHY 6109: Reactor Physics

Interactions of neutrons with matter, cross-sections for neutron reactions, thermal neutron cross-sections, nuclear fission, energy release in fission, neutron multiplication, nuclear chain reaction, steady state reactor theory, criticality condition, homogeneous and heterogeneous reactor system, neutron moderation, neutron diffusion, control of nuclear reactions, coolant, types of nuclear reactors: power reactor, research reactor, fast reactor, breeder reactor, etc. reactor shielding.

PHY 6110: Radiation Protection

Radiation protection guides, ICRP, IAEA, ILO, ICRU, NCRP's recommendations, Philosophy and objectives of radiation protection, radiation hazards, external and internal radiation, exposure from man-made sources and nuclear installations, medical exposure, low-level exposure, maximum permissible dose, basic radiation safety criteria, basic safety standards, safety regulations in nuclear installations, radiation safety and legal aspects in transport of radioactive materials, radio-active waste disposal, radiation protection in diagnostic radiology, therapy and nuclear medicine.

PHY 6111: Basic Anatomy and Physiology

Feature of medical terminology, Cells and metabolism, Skeleton and muscles system, Ligament, Joint, Heart and circulatory system, breathing system, Alimentary canal (digestive system), Urigenital system, Water and electrolyte balance in the body, Endocrine system, Blood producing organs, Brain and nervous systems, Sense organs, Skin.

PHY 6113: Advanced Nuclear Physics

Compound nucleus: Formation of compound nucleus cross-section; Continuum theory of cross section; Breit-Wigner resonance formula. Direct reactions: Statistical theory of nuclear reactions, transfer reactions; The DWBA theory and its application. Optical model; Kapur-Peierls dispersion formula; Butler's theories; Giant resonances; Nilsson's distorted potential model; Nuclear surface deformations; Collective vibrations and rotations. Nuclear analytical techniques: Neutron activation analysis; Particle induced X-ray and gamma ray emission. Elementary particles: Spectrum and interactions of known particles; Production and decays of pions, muons and hyperons; Meson exchange potential

C: Courses in Atmospheric Physics

PHY 6204: Remote Sensing and GIS

Fundamentals of remote sensing, Sensors, Optical mechanical scanner, Cameras for remote sensing, Remote sensing satellites, Geostationary meteorological satellite, Data used in remote sensing, Procedure of data analysis, Calibration and validation, Satellite image processing systems, Generation of thematic maps, Stereoscopy, Atmospheric and geometric corrections, Coordinate transformation, Collinearity equation, Resampling and interpolation, Application of remote sensing, Cyclone monitoring, Vegetation map, Estimation of precipitation, Geographic information system (GIS), GIS and remote sensing, Basic function of GIS, GIS information infrastructure, GIS hardware and software, Special query and analysis.

PHY 6205: Climatology I

Concept of weather and climate, Climatic elements, Climatic factors, Cause of seasons, Climatology of (Temperature, Rainfall, Thunderstorm, Drought, Wind) Bangladesh, Global distribution of insolation, Albedo of different surfaces, Air temperature, Mean sea level pressure and wind, Diurnal and annual variations of surface air temperature at different latitudes and over the globe, Global distribution of precipitation, Global Heat Budget, Diurnal and annual variation of precipitation, Global distribution of atmospheric perils, Air masses, their classifications, source regions, modification and associated weather, El Nino, La Nina, Southern Oscillation, Madden-Julian Oscillation, North Atlantic Oscillation, Indian Ocean Dipole Oscillation, Northern Annular Mode or Arctic Oscillation, Northern Pacific Index, Pacific Decadal Oscillation, Interdecadal Pacific Oscillation.

PHY 6206: Climatology II

Background on climate and general wind circulation, Climatic classification, Koppen, Thornthwaite etc., Fundamental meteorological factors affecting the climate, Past climate revealed by meteorological observation, Methods of palaeoclimatology, Possible causes of climatic change, Introduction to climate system, Role of greenhouse gases, Global warming, Sea level rise, Effects of climate extremes, Statistical background for climate variability, Modes of climate variability including NAO, ENSO, Impacts of natural and anthropogenic factors on climate, Equilibrium in climate change parameters, Sensitivity of feedback mechanisms, Concept of climate change models, Energy cycle, Tropical Ocean and their role in climate control, Physical processes in general circulation.

PHY 6207: Radar Meteorology

Electromagnetic waves and its propagation and interaction, Radar technologies (radar hardware: transmitter, modulator, waveguide, antenna, receiver), Different types of radar, Radar displays, Radar equation for point and distributed targets (radar target: spherical target, birds, aircraft, buildings, water towers and radio towers), Plan position indicator (PPI), Range height indicator (RHI); Radar reflectivity, Radar reflectivity factor (Z), Z-R relationship, Attenuation, Inversions, Ground cluttering, Meteorological target and its measurement (cloud, rain, snow, bright band and hail), Observations of winds, Doppler velocity measurement, Observations of fair weather, Advanced uses of meteorological radar (rainfall measurement, dual-wavelength radar, polarization diversity, dual-Doppler processing), Next generation radar (NEXRAD).

PHY 6208: Atmospheric Modeling and Data Assimilation

The Governing Equations, Atmospheric equations of motion on spherical coordinates, Basic wave oscillations in the atmosphere, Shallow-water equations, Filtering approximations, Primitive equations and vertical coordinates, global and regional models, Nonhydrostatic

models, Numerical discretization, initial value problems, Boundary value problems, Boundary conditions for regional models, Sub-grid scale physical processes and Reynolds averaging, Model parameterizations, Data assimilation and least squares methods, Optimal interpolation and 3D-Var, Ensemble Kalman filter.

PHY 6211: Atmospheric Physics

Structure and composition of the atmosphere, solar and terrestrial radiation, heat balance; Layers of the atmosphere; Atmospheric parameters, dry and moist air, virtual temperature, hydrostatic and hypsometric equations. Thermodynamics of the atmosphere: Adiabatic lapse rate, potential and equivalent potential temperatures, air stability and instability, thermodynamic diagrams. Cloud formation and types, thunderstorms and lightning, precipitation processes; Front and air masses. Atmospheric instruments; Meteorological analysis.

PHY 6212: Dynamic Meteorology

Geophysical fluid dynamics: Local and material time derivatives, conservation principles, Euler and Navier-Stoke's equations, rotating and stratified flow, scale analysis, equations of motion in rotating spherical coordinates, hydrostatic approximation, Coriolis force. Geostrophic balance, gradient wind, cyclostrophic and inertial flow, vertical shear, thermal wind; circulation theorems, vorticity and potential vorticity equations. Atmospheric wave motions: Rossby waves, acoustic waves, Kelvin waves, gravity waves; Atmospheric turbulence, quasi-geotropic approximation, barotropic and baroclinic instabilities.

PHY 6213: Tropical Meteorology

Features in tropics: Radiative process in the tropics, tropical circulation, trade winds, Hadley cell, Walker cell, equatorial trough, tropical convection, precipitation and its variability, ITCZ, easterly waves,

convective systems, tropical cyclones. Monsoon: Causes of monsoon, key elements of Asian summer and winter monsoons, onset and withdrawal of monsoon, active and break phases, monsoon trough, monsoon depression; Intra-seasonal and inter-annual variabilities of monsoon rainfall and its prediction; Monsoon characteristics over different global regions.

2.8 Research Areas

2.8.1 Solid State Physics

The research in this branch is carried out in the following fields:

i. Magnetism, Ferroelectrics, Superconductors, Semiconductors and Multiferroics

Prof. Dr. Md. Feroz Alam Khan, Prof. Dr. A. K. M. Akther Hossain, Dr. Muhammad Samir Ullah, Dr. Mohammad Khurshed Alam and Dr. Md. Azizar Rahman are working in this group. Magnetic, ferroelectric and multiferroic materials are grown in the form of nanocrystalline, polycrystalline and thin films, and thoroughly investigated to explore their various properties. This group has well equipped experimental setup to characterize the ac magnetic properties (initial permeability, magnetic loss factor as a function of frequency up to 120 MHz and temperature), transport properties (impedance as a function of frequency up to 120MHz and temperature, dielectric constants, and dielectric loss factor) and magnetoelectric voltage coefficient. This group is also preparing manganite materials using solid-state reaction technique and investigating their magnetoresistance and magnetocaloric effect.

This group also studies the properties of high T_c, low T_c, and unconventional chiral non-centrosymmetric superconductors. The physical properties of low T_c and unconventional superconductors are computed and investigated by ab-initio density functional theory (DFT).

Moreover, this group is working on oxide semiconductors, diluted magnetic semiconductors (DMS), metallic alloys and metal halides.

Vertically aligned semiconducting/metallic nanowires/nanorods are grown using vapour phase transport method. The structural, transport properties and luminescence as a function of photon energy and temperature of these materials are studied. This group has further intension to control the dimension of nanowire/nanorod, and optimize their properties for designing optoelectronic devices (LED and LASER). This group has active collaboration with Osaka University, Japan and University of Technology Sydney, Australia.

ii. Polymer and Polymer Nanocomposites

Prof. Dr. Md. Forhad Mina, Prof. Dr. Mohammad Jellur Rahman, Dr. Parvin Sultana and Mr. Md. Mehdi Masud are working with soft condensed matters, especially with polymeric materials. Currently, this group is preparing polymer thin films by plasma polymerization technique and characterizing them by various methods. Besides, this group is processing and developing noble polymer materials such as polymer blends and composites by extrusion molding, injection molding, and hot-pressing methods. The structural, electrical, mechanical, micromechanical, thermal, and surface morphological properties of these materials are characterized by various techniques. These research studies are undertaken considering the potential applications of the newly emerging properties of polymer blends and nanocomposites. This group has further intention to develop methods for polymer crystallization. In addition, they are also working on the synthesis and functionalization of carbon nanotubes and other nanoparticles, which are being incorporated into different synthetic and natural polymers to obtain technologically important nanocomposites. This group is also working on computational Condensed Matter Physics (DFT, RPA and BerkeleyGW) so that the computational results can be compared with the experimental results.

iii. Crystal Growth and Thin Film

Prof. Dr. Jiban Podder, Prof. Dr. Md. Mostak Hossain, Dr. Muhammad Rakibul Islam, and Dr. Mehnaz Sharmin are working in this group. This group is engaged in studying the nucleation, growth kinetics and habit modification of some technologically important and highly transparent nonlinear optical (NLO) crystals from low-temperature solution growth technique. Materials with large NLO susceptibilities are of current interest in the area of harmonic generation and optical modulation.

This group is capable of the deposition of high-quality metal oxide thin films. Research interests are focused on exploring and understanding the physical properties of functional electronic materials and low dimensional nanostructured materials of wide bandgap oxide semiconductors for transparent electronic, energy-efficiency-related prospective optoelectronic devices and different sensor technologies. This group is studying the surface morphology, optical properties, electrical properties of thin films with an aim to develop low cost and efficient gas sensing devices.

iv. Nanotechnology

Prof. Dr. Mohammed Abdul Basith and Dr. Muhammad Rakibul Islam are working on advanced materials and nanotechnology. This group involves synthesis, modeling, characterization, and manipulating properties of matter at the nanoscale. They are working on various research such as (i) Solar hydrogen production via water splitting using locally fabricated novel photocatalysts, (ii) Synthesis of rGO and MoS_2 based nanocomposites and investigation of their photocatalytic and electrochemical properties for energy applications, (iii) Structural, dielectric, ferroelectric and magnetic properties of multiferroic nanomaterials, (iv) Synthesis of inorganic as well as metal halide perovskites by rapid hot-injection technique and investigation of their multiferroic and photocatalytic properties, and (v) DFT based

simulations with Hubbard U corrections on the structural, optical, electronic and magnetic properties of perovskite materials.

This group is also focused on the synthesis of low-dimensional nanostructured materials (nanoparticles and 2D materials), eco-friendly polymer nanocomposite using carbon nanotube, graphene nanofillers, nanostructured supercapacitors for energy storage, and photocatalysis of nanostructured materials.

2.8.2 Biophysics, Medical Physics and Health Physics

Prof. Dr. Afia Begum and Prof. Dr. Mohammad Abu Sayem Karal are working in this research field. This group is working on the synthesis of lipid vesicles (large unilamellar vesicles – LUVs, giant unilamellar vesicles-GUVs) and observing their static and dynamic functions due to the interaction of nanoparticles, antimicrobial peptides, etc. This group has developed an irreversible electroporation technique for investigating the pore formation or rupture in GUVs with an aim to cancer cell ablation. The Micropipette aspiration technique is using for measuring the elasticity (elastic modulus, bending modulus) of membranes of vesicles/cells. The group is also working on the focused impedance method and the nerve conduction velocity measurement under the collaboration of the Department of Biomedical Physics and Technology, University of Dhaka, Bangladesh. Under the collaboration with Bangladesh Atomic Energy Commission, this group conducts research on radiation dosimetry, environmental radioactivity and radiation protection. This group also investigates the quality control of the machines used in the diagnosis and treatment of cancer with radiation.

2.8.3 Atmospheric Physics

Prof. Dr. Md. Rafi Uddin, Prof. Dr. Nasreen Akter and Mr. A. T. M. Shafiul Azam are working in this research field. The atmospheric Physics group is dealing with the topics of synoptic and mesoscale

phenomena in the atmosphere and surrounding ocean, which broadly cover monsoon meteorology, satellite meteorology, radar meteorology, cloud dynamics, tropical cyclone, and climate change. This group is analyzing the extreme weather like severe thunderstorm, lightning, heavy rainfall, temperature, drought, tropical cyclone, tornado and aerosol-concentration in and around Bangladesh using the observational and model data. They are using mesoscale and cloud-resolving models for studying the detailed characteristics and organization of the convection developed in Bangladesh and surroundings. This group is currently involved in several collaborative research projects with Japan and Australia.

2.9 Postgraduate Laboratory facilities

Electrical Transport Measurement

This department has a DC transport rig. The resistance of a material can be measured using a four-probe technique as a function of temperature (300-77K) both in zero field and in presence of a 0.8 T magnetic field. A homemade liquid nitrogen cryostat is used for Colossal Magnetoresistance (CMR) and superconductivity studies. Also, high resistivity (e.g. polymer, ceramic, etc.) measurement facilities are available. Besides these, two Impedance Analyzers of model Wayne-Kerr 6500B (20 Hz to 120 MHz) are available for AC electrical and magnetic measurements.

Ferroelectric measurements

This department has a computer interfaced ferroelectric loop tracer system. The polarization vs electric field hysteresis loops at different temperatures can be measured directly using this loop tracer. Beside this, the leakage current density can also be measured as a function of the applied electric field.

UV visible spectrometer

A UV-2600 plus spectrophotometer is available in this department. By using the optional integrating sphere, the measurement wavelength range of the UV-2600 can be extended to the near-infrared region of 1400 nm. A dual-beam UV-VIS spectrophotometer is also available in the department. This instrument is capable of analyzing the optical absorbance and transmittance of thin film and nanoparticles.

High power Xenon Lamp for Photocatalytic experiment

Photocatalytic experiments are available for a wide range of synthesized materials both at bulk and nanoscale. A 500 W Xenon lamp is installed and incorporated with required measurement facilities.

Gas Chromatograph

A gas chromatograph (Shimadzu, Japan) is available to measure the various components of gas particularly the amount of Hydrogen produced by water splitting.

Closed Cycle Cryocooler

Two sets of Closed Cycle Cryocoolers are available at the department. This apparatus is used for low temperature (300 K-10 K) transport and magnetic measurements. One cryocooler is attached to a Vibrating Sample Magnetometer (VSM) and the other is used in the transport measurements.

Torque Magnetometer

This magnetometer is used for the measurement of magnetic anisotropy (high temperature) and has a sensitivity of 10^{-9} N-m.

Vibrating Sample Magnetometer

A sensitive (10^{-5} emu) vibrating sample magnetometer (VSM) is available in this department.

Plasma polymerization

A capacitively coupled plasma polymerization system has been fabricated locally in this department. It works at line frequency and RF frequency at a chamber pressure of about 10^{-1} Torr. It is used to deposit thin organic films onto different substrates.

Extrusion and Injection Molding

Polymer blends and composites, which are emerging as advanced polymeric materials for their superior properties and have potential applications, are prepared with these machines.

Plasma Surface Modification Unit

Plasma surface modification technique has been established to functionalize nanomaterials especially carbon nanotubes.

Chemical Bath Deposition Setup

To deposit inorganic thin films, a chemical bath deposition (CBD) unit is established. Using this setup semiconducting thin films can be deposited onto different substrates controlling different deposition parameters.

Nanoparticle/Nanorods Synthesis Setup

Microwave-assisted hydrothermal unit has been fabricated locally to synthesis nanoparticles for the advanced technology, especially ZnO nanorods.

Ultrasonic Bath and Probe Sonicator

Both ultrasonic bath and probe sonicator (Model: 150 V/T, 150 W, 20 Hz, Biologics Inc., USA) are available in the department, which can be used to clean different substrates and to disperse nanoparticles.

Hot Air Oven

A hot air oven is available to dry and heat samples up to 300 °C.

High Temperature Furnace

This department has a couple of tubes and muffles furnaces. The maximum temperature that can be achieved in these furnaces is1400 °C. A high temperature furnace controlled with a modified atmosphere (inert gases) is also available.

Interferometric technique

Thickness measurement of transparent thin films is possible by interferometric technique.

Hydraulic pressing machine

Several hydraulic press machines are available in this department for making pellets, toroid shaped, polymer blend and composite samples.

DC Electrical Measurement Unit

DC electrical measurement setup is available where a regulated DC power supply (Model: 6545A, Agilent, Japan) and Electrometer (Keithley 197A, Keithley Instruments, USA) is used to measure current, resistance and voltage across polymeric materials.

Vacuum Evaporation Technique

Vacuum Evaporation Techniqueis available for the deposition of metallic thin films using an Edward coating unit (Model 306) and a High Vac evaporation unit.

Dip Coating technique for thin film deposition

A Micro-controller Controlled, Multi-vessel Dip Coating System for the deposition of thin film is available in the department. This is a state-of-the-art instrument that is very sophisticated, versatile, fully Micro-Controller controlled and user-friendly. This unit is also capable of synthesis of thin film by Successive Ion Layer Adsorption and Reaction (SILAR) Coating.

Nanoparticle and nanostructured materials synthesis technique

This department has facilities for the synthesis of zero-dimensional nanostructured materials and two-dimensional graphene.

High-speed centrifuge machine

The table top high speed (a maximum speed of 16,500 rpm) centrifuge machine is capable of separating the nanostructured materials from the fluid.

Contact Angle meter

A contact angle measurement system is also available in the department for measuring the Dynamic Contact Angle as well as Surface Parameter.

ATR-FTIR Spectrometer

An Attenuated Total Reflection-Fourier Transform Infrared (ATR-FTIR) (Shimadzu IRSpirit) spectrophotometer is available. This instrument includes 23 application-specific workflows that can be utilized without involving any complicated parameter setup process.

Photocatalytic properties measurement chamber

A Photocatalytic properties measurement chamber is available for studying the photodegradation performance of thin films and nanoparticles.

Electrochemical Workstation/Potentiostat/Galvanostat with EIS

A CS310 electrochemical workstation (corrtest, china) is available in the department. It is a comprehensive research platform for corrosion, batteries, electrochemical analysis, sensor, life science and environmental chemistry, etc.

Optical Polarizing Microscope

This department has two polarizing microscopes.

Crystal Growth

Crystal growth set-up by solution growth technique is available in the department.

Spray Pyrolysis Deposition Unit

A Spray Pyrolysis set-up is available for the deposition of high-quality thin films.

Inverted Phase Contrast Fluorescence Microscope

An inverted phase contrast fluorescence microscope (IX 73, Olympus, Japan) attached with charged coupled camera-CCD (DP22, Olympus, Japan) is available to investigate the static and dynamic nature of giant unilamellar vesicles (GUVs) and cells.

Irreversible Electroporation (IRE) instrument

A microcontroller-based IRE device with the high voltage (100 – 800 V/cm) power supply is used for the ablation of tumor/cancer cells along with the rupture of giant unilamellar vesicles.

Fluorescence Spectrometer

A Fluorescence Spectrometer (F-7000, Hitachi, Japan) is used to investigate the leakage of internal fluorescent content from the inside of vesicles to the outside environment.

Refrigerated Centrifuge

A refrigerated centrifuger (NF 1200R, NUVE, Turkey) controls a wide range of temperatures from -9 °C to +40 °C. It is used for biological samples. The maximum speed for Angle Rotor is14000 rpm.

Diaphragm Vacuum Pump

Diaphragm pump (MVP 015-2, PFEIFFER, Germany) connected with a desiccator (DURAN, Germany) is used for fine drying the lipid samples.

Mini Extruder

The Avanti Mini-Extruder is used for preparing large unilamellar vesicles (LUVs).

Peristaltic Pump

A dual channels compact peristaltic pump (SP-Mini pump, Good pump, China) is used to flow the solution with a flow rate of 0.0024-190 mL/min. It is generally used for the purification of lipid vesicles.

Laboratory Freezer

A tall Freezer (SS), SIEMENS No Frost (GS36NVI30G) is used to preserve the lipids at -26 °C. In addition, a refrigerator is used to preserve the chemicals and reagents in the laboratory.

Laboratory Oven

The drying oven Ecocell (MMM Group, Germany) is used for drying various types of goods. The chamber volume is 111 L and the temperature range is 5 °C - 300 °C.

Incubator

The incubator controls the temperature at 37 °C precisely. It is used to grow the lipid vesicles and cells in the laboratory.

Vortex Mixer

Vortex Mixers both Test Tube and Flat Head (250VM and 260VM, Hwashin Technology Co., South Korea) are used to vortex the biological samples.

Magnetic Stirrer with Hot Plate

A motor drive magnetic stirrer (MSH 420, Boeco, Germany) with an all-in-one glass-ceramic hot plate is used for analyzing the biological samples from ambient temperature to 450 °C.

pH Meter

A pH bench top meter (BT-675, Boeco, Germany) is used to control the pH of buffer preciously.

Bath Sonication

A bath sonicator (POWERSONIC 520, Hwashin Technology Co., South Korea) is used to clean the glass vial precisely. It is also used to mix the samples.

Nitrogen Gas Cylinder with Multistage Regulator

A nitrogen gas cylinder with multistage regulator (Linde, Bangladesh) is used to dry the dissolved chloroform from the lipid solution.

Fume Hood

A fume hood (FH 1200 E, Biobase, China) is used to protect the lab environment and operator during general chemical applications.

Analytical Balance

An analytical balance (4 digits) with a readability ranging between 0.0001g - 220 g is used to measure the sample correctly.

Modeling and Simulation facilities

The Weather Research and Forecasting (WRF) Model is a next-generation mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting applications. It allows researchers to generate atmospheric simulations based on real data (observations, analyses) or idealized conditions. WRF model is set up in the Atmospheric lab, which serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometers. It is used to simulate and forecast different weather and climate phenomena like severe Nor'wester (thunderstorms), tornadoes, lightning, cyclone, mesoscale convection and monsoon rain in Bangladesh and its surroundings.

High-End Servers and Online Storage

This department has two Dell PowerEdge servers: 4U rack-mounted server (Processor: 80, RAM: 192GB, HDD: 3.3 TB) and 2U rack-mounted server (Processor: 32, RAM: 128GB, HDD: 7.2 TB), and data storage facilities (48 TB SATA HDD). Different types of weather simulations such as tropical cyclones, severe thunderstorms, mesoscale convective systems, etc. can be performed and analyzed with these facilities.

Blitzortung Lightning Detector

This department has a Blitzortung Lightning Detector. Blitzortung is a project run by Germany that connects a network of hundreds of lightning sensors around the world to track lightning strikes within seconds of their striking the surface of the earth.

2.10 Library

The reading room of the library of the Physics department can accommodate 30 students at a time to provide reading facilities. Library hours: Saturday-Wednesday (9:00 AM to 5:00 PM)

2.11 Research Grants/Fellowship/TA/RA

Research grants are available for students of postgraduate programs. Research proposals should be submitted to the CASR through BPGS for approval of the grants. About 10 teaching assistantships are awarded by the department in each semester based on their excellent academic results. A few numbers of fellowships and research assistantships are also available in this department depending on available funding.

2.12 Physics Bulletin

The “BUET Physics Bulletin” is published by this department in every year. Its aim is to foster and circulate news and views about State-of-Art of Physics as well as original research findings.

2.13 Alumni Association

BUET Physics alumni association is functioning various activities in the department.

CHAPTER 3

ORDINANCE FOR M. Sc. DEGREE PROGRAM

3.1 Introduction

Entry requirement for an M. Sc. student is given in section 3.2. M. Sc. is generally of one and half year's (three semesters) duration. An M. Sc. student is required to complete 6 theory courses of total 18 credit hours in Physics. Besides these courses, a student has to submit a dissertation equivalent to 18 credit hours on his/her research findings.

3.2 Admission Requirements

3.2.1 For admission to the courses leading to an M. Sc. degree in Physics an applicant

a) must have at least 50% marks or a minimum GPA of 2.50 out of 4.00 or its equivalent in four years B. A./B. S./B. Sc. (Hons.) in Physics/Applied Physics, Electronics and Communication Engineering, or B. Sc. Engg. in Electrical & Electronics Engineering/Materials & Metallurgical Engineering or in a relevant discipline.

b) having three years B. A./B. S./B. Sc. (Hons.) in Physics/Applied Physics, Electronics and Communication Engineering, or in a relevant discipline must have at least 50% marks or a minimum GPA of 2.50 out of 4.00 or its equivalent in M. A./M. S./M. Sc. in Physics or in a relevant discipline.

3.3 Admission and Registration Procedures

3.3.1 Applications for admission to the above courses shall be invited through regular means of advertisement and shall be received by the Registrar.

3.3.2 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 the University.

3.3.3 After admission each student shall be assigned, by the appropriate BPGS, an Advisor from among the teachers of the department not below the rank of an Assistant Professor. In advance of each enrolment and course registration for any semester, the Advisor or Supervisor (as appointed by Art. 3.8.1 of this ordinance) shall check and approve his/her student's schedule for courses, pre-requisites as recommended by the Selection Committee and the total hours. The student is expected to consult his/her Advisor on all academic matters. However, it is the responsibility of the individual student to see that his/her schedule conforms to the academic regulations.

3.3.4 Every registered student shall get himself/herself enrolled on payment of prescribed fees and other dues as per the University rules before the commencement of each semester. In an academic year there will be normally two semesters. All courses registration must be completed within two weeks from the start of a semester, otherwise, the student shall not be allowed to continue the course in that semester.

3.3.5 On the recommendation of the appropriate BPGS and CASR the rules for admission into the University for Postgraduate 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.

3.3.6 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 if the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer (CMO) of the University or some other academic commitments which precluded registration prior to be last date of registration.

Student 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.

3.3.7 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 Registrar in a prescribed form though 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 CMO, BUET or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the relevant BPGS.

3.4 Academic Requirements and Regulations

3.4.1 The minimum duration of the M. Sc. course shall normally be three semesters. A candidate for the M. Sc. 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.

3.4.2 Academic progress shall be measured in terms of credit hours earned by a student. One credit hour course shall normally require 14 hours of lecture for one semester, while one credit hour for thesis/laboratory should normally require 42 hours of work for one semester. The number of credit hours for each course shall be as specified in the syllabus of the respective department.

3.4.3 The credit hour requirement for the M. Sc. program shall be as follows.

3.4.3.1 For the degree of M. Sc. in Physics a student must earn a minimum of 36 credit hours including a thesis for which 18 credit hours shall be assigned.

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

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

3.4.4.2 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 University. 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.

3.4.4.3 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.

3.4.5 The courses of study in the department shall be as recommended by the BPGS and the faculty 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.

3.4.6 A student on 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 first enrolment in the respective program at BUET and that the student obtained a minimum GP of 3.0 out of 4.0 or its equivalent in such courses and that the courses are equivalent to the approved courses of BUET.

3.5 Grading system

3.5.1 Final grades for courses shall be recorded as follows:

Grade	Merit description	Grade points
A+	Excellent	4.0
A	Very good	3.5
B+	Good	3.0
B	Average	2.5
C	Pass	2.0
F	Failure	0.0
I	Incomplete	-
S	Satisfactory	-
U	Unsatisfactory	
W	Withdrawn	-

3.5.2 Courses in which the student gets F grades shall not be counted towards credit hour requirements and for the calculation of GPA.

3.5.2.1 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 2.75.

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

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

3.5.3 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 concerned Department within one week after the examination to get an I grade in that course. It must be completed within the next two semesters; otherwise, the I becomes an F grade. He/She may, however, be allowed to register without further payment of tuition fees for that course.

3.5.4 Satisfactory or Unsatisfactory- used only as final grades for thesis and non-credit courses. Grade for thesis “In Progress” shall be so recorded. If, however, thesis is discontinued an I grade shall be recorded.

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

3.5.6 A student shall withdraw officially from a course within two working weeks of the commencement of the semester or else his/her 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)

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

90% and above	:	A+
80% to below 90%	:	A
70% to below 80%	:	B+
60% to below 70%	:	B
50% to below 60%	:	C
Below 50%	:	F

3.6 Conduct of Examination

3.6.1 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 courses offered in a semester at the end of that semester, the dates of which shall be announced by the Controller of Examinations, BUET as advised by Dean of the respective Faculty at least two weeks before the commencement of the examination. The final grade in a course shall be based on the performance in all tests, assignments and/or examinations.

3.6.2 The Controller of Examinations shall keep upto-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/her academic program from the office of the Controller of Examinations on production of statement of clearance from all departments/institutes/offices.

3.6.3 The BPGS of a 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 Vice-Chancellor for approval.

3.7 Qualifying Requirements

3.7.1 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.

3.7.1.1 Two courses may be repeated for improvement with the prior approval of the Head of the department on the recommendation of the Supervisor. Such approval shall be reported to the BPGS.

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

3.7.2 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.

3.7.3 If at the end of the second or any subsequent semester, the cumulative GPA falls below 2.5, he/she shall not be allowed to continue in the program.

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

3.8 Thesis

3.8.1 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. However, in special cases, a full-time member of the staff belonging to a department outside the student's relevant department, or an institute/centre of the University may be appointed as Supervisor, if the research content of the thesis is within the field of specialization of the member of the department/institute/centre. 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 of the CASR on the recommendation of the relevant BPGS after completion of at least 12 credit hours of course work.

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

3.8.3 The research work must be carried out in this University 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 university.

3.8.4 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 on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the department.

3.8.5 The student shall certify 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.

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

3.8.7 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.

3.8.8 Thesis Examination Board

3.8.8.1 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. 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 (Ex-officio)	Member
(iv)	One or two members from within the Department	Member
(v)	One external member from outside the student's Department	(External)

3.8.8.2 If any examiner is unable to accept the appointment or has to relinquish his appointment before the examination, the Vice-Chancellor 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.

3.8.8.3 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.

3.9 Striking off and Removal of Names from the Rolls

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

(i) Non-payment of dues within prescribed period. Postgraduate students residing in the halls of residence shall be subject to the same conditions as allowed in the Ordinance Relating to the Board of Residence and Discipline.

(ii) Failing to proceed with the program by the exercise of Art. 3.4.1 or 3.7.2 or 3.7.3 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 Board of Residence and Discipline.

(v) Withdrawn officially from all the courses and/or thesis.

3.10 Academic Fees

Items of Academic fees shall be as per rules, and the fees shall be reviewed and recommended from time to time by the Academic Council.

3.11 Refund of Fees

A student withdrawing officially from all courses and/or thesis as per Art. 3.9(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 two working weeks from the commencement of the classes. Thesis registration fees in any case are not refundable.

CHAPTER 4

ORDINANCE FOR M. Phil. DEGREE PROGRAM

4.1 Introduction

Entry requirement for an M. Phil. student is given in section 4.2. M. Phil. is generally of 2 years duration (Four semesters). An M. Phil. student is required to complete 6 theory courses of total 18 credit hours in Physics. Besides these courses, a student has to submit a dissertation equivalent to 30 credit hours on his/her research findings.

4.2 Admission Requirements

4.2.1 For admission to the courses leading to an M. Phil. degree in Physics an applicant

a) must have a minimum Grade Point Average (GPA) of 3.50 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 2.00 out of 5.00 or a third division or equivalent in any of the aforementioned examination.

b) must have at least 50% marks or a minimum GPA of 2.50 out of 4.0 or its equivalent in B. Sc. degree/M. Sc. degree in the relevant branch.

c) Specific requirements for Physics department are spelt out in the following section.

4.2.2 For admission to the course leading to the award of M. Phil. degree in Physics, an applicant must have a four-year B. Sc. degree (or equivalent) with Honours or M. Sc. degree in Physics or Applied Physics or B. Sc. in Electrical & Electronic Engineering/Materials and Metallurgical Engineering. An

applicant with M. Sc. degree (or equivalent) but not having a Bachelor (honours) degree in Physics or Applied Physics should have a first class (or equivalent) in the M. Sc. degree.

4.3 Admission and Registration Procedures

4.3.1 Applications for admission to the above courses shall be invited through regular means of advertisement and shall be received by the Registrar.

4.3.2 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 the University.

4.3.3 After admission each student shall be assigned, by the appropriate BPGS, an Advisor from among the teachers of the Department not below the rank of an Assistant Professor. In advance of each enrolment and course registration for any semester, the Advisor or Supervisor (as appointed by Art. 4.8.1 of this ordinance) shall check and approve his/her student's schedule for courses, pre-requisites as recommended by the Selection Committee and the total hours. The student is expected to consult his/her Advisor on all academic matters. However, it is the responsibility of the individual student to see that his/her schedule conforms to the academic regulations.

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

otherwise, the student shall not be allowed to continue the course in that semester.

4.3.5 On the recommendation of the appropriate BPGS and CASR the rules for admission into the University for Postgraduate 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.

4.3.6 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 if the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer (CMO) of the University or some other academic commitments which precluded registration prior to be last date of registration.

Student 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.

4.3.7 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 Registrar in a prescribed form though 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 CMO, BUET or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the relevant BPGS.

4.4 Academic Requirements and Regulations

4.4.1 The minimum duration of the M. Phil. course shall normally be four semesters. A candidate for the M. Phil. 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.

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

4.4.3 The credit hour requirement for the M. Phil. program shall be as follows.

4.4.3.1 For the degree of M. Phil. in Physics a student must earn a minimum of 48 credit hours including a thesis for which 30 credit hours shall be assigned.

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

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

4.4.4.2 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 University. 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.

4.4.4.3 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.

4.4.5 The courses of studied in the department shall be as recommended by the BPGS and the faculty 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.

4.4.6 A student on 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 first enrolment in the respective program at BUET and that the student obtained a minimum GP of 3.0 out of 4.0 or its equivalent in such courses and that the courses are equivalent to the approved courses of BUET.

4.5 Grading system

4.5.1 Final grades for courses shall be recorded as follows:

Grade	Merit description	Grade points
A+	Excellent	4.0
A	Very good	3.5
B+	Good	3.0
B	Average	2.5
C	Pass	2.0
F	Failure	0.0
I	Incomplete	-
S	Satisfactory	-
U	Unsatisfactory	
W	Withdrawn	-

4.5.2 Courses in which the student gets F grades shall not be counted towards credit hour requirements and for the calculation of GPA.

4.5.2.1 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 2.75.

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

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

4.5.3 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 concerned department within one week after the

examination to get an I grade in that course. It must be completed within the next two semesters; otherwise, the I become an F grade. He/She may, however, be allowed to register without further payment of tuition fees for that course.

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

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

4.5.6 A student shall withdraw officially from a course within two working weeks of the commencement of the semester or else his/her 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 Advisor, 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)

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

90% and above	:	A+
80% to below 90%	:	A
70% to below 80%	:	B+
60% to below 70%	:	B
50% to below 60%	:	C
Below 50%	:	F

4.6 Conduct of Examination

4.6.1 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 courses offered in a semester at the end of that semester, the dates of which shall be announced by the Controller of Examinations, BUET as advised by Dean of the respective Faculty at least two weeks before the commencement of the examination. The final grade in a course shall be based on the performance in all tests, assignments and/or examinations.

4.6.2 The Controller of Examinations 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/her academic program from the office of the Controller of Examinations on production of statement of clearance from all departments/institutes/offices.

4.6.3 The BPGS of a 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 Vice-Chancellor for approval.

4.7 Qualifying Requirements

4.7.1 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.

4.7.1.1 Two courses may be repeated for improvement with the prior approval of the Head of the department on the recommendation of the Supervisor. Such approval shall be reported to the BPGS.

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

4.7.2 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.

4.7.3 If at the end of the second or any subsequent semester, the cumulative GPA falls below 2.5, he/she shall not be allowed to continue in the program.

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

4.8 Thesis

4.8.1 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. However, in special cases, a full-time member of the staff belonging to a department outside the student's relevant department, or an institute/centre of the University may be appointed as Supervisor, if the research content of the thesis is within the field of specialization of the member of the department/institute/centre. 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 of the CASR on the recommendation of the relevant BPGS after completion of at least 12 credit hours of course work.

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

4.8.3 The research work must be carried out in this University 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 university.

4.8.4 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 on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the department.

4.8.5 The student shall certify 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.

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

4.8.7 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.

4.8.8 Thesis Examination Board

4.8.8.1 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. 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 (Ex-Officio)	Member
(iv)	One or two members from within the Department	Member
(v)	One external member from outside the student's Department	(External)

4.8.8.2 If any examiner is unable to accept the appointment or has to relinquish his appointment before the examination, the Vice-Chancellor 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.

4.8.8.3 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.

4.9 Striking off and Removal of Names from the Rolls

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

(i) Non-payment of dues within prescribed period. Postgraduate students residing in the halls of residence shall be subject to the same conditions as allowed in the Ordinance Relating to the Board of Residence and Discipline.

(ii) Failing to proceed with the program by the exercise of Art. 4.4.1 or 4.7.2 or 4.7.3 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 Board of Residence and Discipline.

(v) Withdrawn officially from all the courses and/or thesis.

4.10 Academic fees

Items of Academic fees shall be as per rules, and the fees shall be reviewed and recommended from time to time by the Academic Council.

4.11 Refund of Fees

A student withdrawing officially from all courses and/or thesis as per Art. 4.9 (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 two working weeks from the commencement of the classes. Thesis registration fees in any case are not refundable.

CHAPTER 5

ORDINANCE FOR Ph. D. DEGREE PROGRAM

5.1 Introduction

Entry requirement for a Ph. D. student is given in the section 5.2. Ph. D. is generally 3 years duration (Six semesters). A Ph. D. student is required to complete 3 theory courses of total 9 credit hours in Physics. Besides these courses, a student has to submit a dissertation equivalent to 45 credit hours on his/her research findings.

5.2 Admission Requirements

5.2.1 For admission to the courses leading to a Ph. D. degree a candidate

a. must have a minimum GPA of 3.50 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 2.00 out of 5.00 or a third division or equivalent in any of the aforementioned examinations.

b. must have at least 50% marks or a minimum GPA of 2.50 out of 4.0 or its equivalent in B. Sc. Engg./four-year B. Sc. degree/M. Sc. in the relevant branch.

c. must have a minimum GPA of 2.75 out of 4.0 or its equivalent in M. Sc. (Thesis)/M. S. (Thesis)/M. Phil. degree in the relevant branch.

5.2.2 For Physics, the minimum qualification for admission shall normally be a four-year Bachelor's degree plus three-semester

M. Sc./M. S. degree with thesis in Physics, or four-year Bachelor's degree plus two-semester M. Sc./M. S. degree with thesis in Physics, or M. Phil. degree in Physics, four-year Bachelor 's degree plus M. Sc. degree with thesis in Electrical & Electronic/Materials & Metallurgical Engineering or its equivalent from any recognized institution.

5.2.3 A candidate enrolled in the Ph. D. program having two-semester M. Sc./M. S. degree with thesis in Physics have to complete additional courses of 12 credit hours with minimum GPA of 2.75 out of 4.00.

5.2.4 A student already working for an M. Phil./M. Sc. degree at this University and showing excellent progress and promise in thesis work may be provisionally transferred to the Ph. D. degree program after completion of M. Phil./M. Sc. course work with a minimum GPA of 3.0 out of 4.0 on approval of the CASR on the recommendation of the BPGS.

5.3 Admission Procedure

5.3.1 A candidate may apply to the Registrar for provisional admission to the Ph. D. program in any semester.

5.3.2 There shall be a Selection Committee in each department as constituted by the BPGS on recommendation of the Head of the department.

5.3.3 A candidate selected by the Selection Committee shall be provisionally admitted and may be required to pass the prerequisite non-credit courses as prescribed by the Selection Committee.

5.3.4 On the recommendation of the appropriate BPGS and CASR the rules for admission into the University for Postgraduate 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.

5.4 Registration

5.4.1 Every selected candidate, unless he/she has already been registered, shall get himself/herself registered with the University.

5.4.2 Every registered candidate (student) shall get himself/herself enrolled on payment of prescribed fees and other dues as per University rules before the commencement of each semester. Course registration must be completed within two weeks from the start of the semester.

5.4.3 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 if the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer (CMO) of the University or some other academic commitments which precluded registration prior to be last date of registration.

Student 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.

5.4.4 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 Registrar in a prescribed form though 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 CMO, BUET or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the relevant BPGS.

5.5 Appointment of a Supervisor

On provisional admission, the Selection Committee, as constituted in Art. 5.3.2, shall submit a name of a Supervisor who shall be a full-time member of the staff belonging to the relevant department and a Co-supervisor from within or outside the department, if necessary. These selections have to be approved by the CASR. The supervisor shall prescribe a plan of study to be undertaken by the student and supervise the progress of the candidate's work.

5.6 Final Registration

A provisionally admitted student shall be deemed to be eligible for final registration as a Ph. D. student with effect from the date of his/her provisional admission after he/she passes the comprehensive examination (Art.5.12.3 of this Ordinance).

5.7 Academic Requirements and Regulations

5.7.1 The minimum duration of the Ph. D. course shall be four semesters from the date of provisional admission. A student must complete all requirements for the Ph. D. degree within six academic years (session) from the date of his provisional admission.

5.7.2 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 work should normally require 42 hours of research work for one semester. The number of Credit hours for each subject shall be as specified in the syllabus of the department.

5.7.3 A student must complete a minimum of 54 credit hours of which 45 credit hours shall be assigned for a thesis.

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

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

5.7.4.2 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 University. 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.

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

5.7.5 The subjects of study in the department shall be as recommended by the BPGS and the Faculty/CASR and approved by Academic Council. The BPGS may review the curriculum from time to time and recommend any changes as may be considered necessary.

5.7.6 The subjects that may be offered in any semester shall be as decided by the relevant department

5.7.7 A student on the recommendation of the relevant BPGS and as approved by the CASR may be allowed to transfer a maximum of 3.0 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 BUET 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 BUET.

5.8 Grading system

5.8.1 Final grades for courses shall be recorded as follows:

Grade	Merit description	Grade points
A+	Excellent	4.0
A	Very good	3.5
B+	Good	3.0
B	Average	2.5
C	Pass	2.0
F	Failure	0.0
I	Incomplete	-
S	Satisfactory	-
U	Unsatisfactory	-
W	Withdrawn	-

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

5.8.2.1 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/Director of the institute on the recommendation of Supervisor provided that the student has fulfilled the total course credit hour requirement in the remaining subjects with a minimum GPA of 2.75.

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

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

5.8.3 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 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; otherwise, the I becomes an F grade. He/she may, however, be allowed to register without further payment of tuition fees for that course.

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

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

5.8.6 A student shall withdraw officially from a course within two working weeks of the commencement of the semester or else

his/her 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 Supervisor, 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.)

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

90% and above	:	A+
80% to below 90%	:	A
70% to below 80%	:	B+
60% to below 70%	:	B
50% to below 60%	:	C
Below 50%	:	F

5.9 Doctoral Committee

A Doctoral Committee for every student shall be proposed by the Supervisor in consultation with the Head of the department. The committee shall be approved by the CASR on recommendation of the BPGS. The Committee shall be formed within six months from the date of the student's provisional admission. The Committee shall consist of at least five members but shall not exceed seven including the Head of the department and the Supervisor. The Supervisor shall act as the Chairman and the Head of the department will be an ex-officio member of the Doctoral Committee. The Doctoral Committee should meet from time to time at the request of the Supervisor to review the progress of the student. In

special circumstances CASR may approve any addition and/or alteration in the Doctoral Committee on the recommendation of the Supervisor through the Head of the Department.

5.10 Research Proposal

5.10.1 The student, after passing the comprehensive examination, shall submit a research proposal to the Doctoral Committee which shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances the Doctoral Committee may recommend through the Head of the Department to CASR for approval of any subsequent changes in the research proposal.

5.10.2 Research work for a thesis shall be carried out in this University or at a place(s) approved by the Doctoral Committee. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work outside the university.

5.11 Conduct of Examination for Course Work

5.11.1 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 Controller of Examinations, BUET as advised by the Dean of the respective Faculties 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.

5.11.2 The Controller of Examinations 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/her academic program from the office of the Controller of Examinations on production of statement of clearance from all departments/institutes/offices.

5.11.3 The BPGS of a department/institute shall recommend the names of the paper setters and examiners for the semester examination at least two weeks before the date of commencement of the examination to the Vice-Chancellor for approval.

5.12 Qualifying Requirements

5.12.1 Course Work

To qualify for the degree a student must earn a minimum GPA of 2.75 based on the weighted average of grade points in his/her course work.

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

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

5.12.2 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.

5.12.3 Comprehensive Examination

The date(s) and time of the comprehensive examination shall be fixed by the Doctoral Committee on the request of the Supervisor. Comprehensive examination shall be held after the completion of the course work by the student.

The comprehensive examination shall comprise of a written examination and/or an oral examination to test the knowledge of the student in his/her field of study and research. The Doctoral Committee shall conduct the comprehensive examination. If a student fails in a comprehensive examination, he/she shall be given one more chance to appear at the examination as scheduled by the Doctoral Committee.

5.12.4 In addition to successful completion of course works and comprehensive examination every student shall submit a thesis on his/her research work fulfilling the requirements.

5.13 Thesis

5.13.1 At the end of the student's research work the student shall submit a thesis which must be an original contribution to engineering/sciences and worthy of publication. At least six type written copies of the thesis in the final form must be submitted to the Head of the department.

5.13.2 The student shall certify that the research work was done by him/her and that this work has not been submitted elsewhere for any other purpose (except for publication).

5.13.3 On completion of the research work and submission of the thesis an oral examination shall be arranged on a date or dates fixed by the Supervisor in consultation with the Head of the department/Director of the institute in which the student shall defend his/her thesis. The student must satisfy the examiners (as

constituted in Art. 5.14.1) that he/she is capable of intelligently applying the results of his/her research to the solution of problems, of undertaking independent research and afford evidence of satisfactory knowledge related to the theory and technique used in his/her research work.

5.14 Examination Board

5.14.1 An Examination Board for every student for thesis and oral examination shall consist of the Doctoral Committee and one or more external examiner(s) to be appointed by the CASR on the recommendation of the thesis supervisor in consultation with the Head of the department. The Board shall consist of at least six members including the Head of the department and the Supervisor. The Supervisor shall act as the Chairman of the Examination Board. At least one external examiner shall be appointed from outside the University. If the external examiner is appointed from outside the country a copy of the thesis should be sent to him/her for his/her evaluation and his/her written opinion be placed before the Examination Board.

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

5.14.3 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.

A student who has been transferred to the Ph. D. program from the M. Phil. program may be awarded an M. Phil. degree on recommendation of the Supervisor, if the student fails to qualify for the award of the Ph. D. degree.

5.15 Striking off and Removal of Names from the Rolls

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

(i) Non-payment of dues within prescribed period. Postgraduate students residing in the halls of residence shall be subject to the same conditions as allowed in the Ordinance Relating to the Board of Residence and Discipline

(ii) Failing to proceed with the program by the exercise of Art 5.7.1 or 5.12.2 or 5.12.3 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 Board of Residence and Discipline.

(v) Withdrawn officially from all the courses and/or thesis.

5.16 Academic Fees

Items of Academic fees shall be as per rules and the fees shall be reviewed and recommended from time to time by the Academic Council.

5.17 Refund of Fees

A student withdrawing officially from all courses and/or thesis as per Art. 5.15(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 two working weeks from the commencement of the classes. Thesis registration fees in any case are not refundable.

CHAPTER 6

POSTGRADUATE THESES WRITING AND PRESENTATION

6.1 General Guidelines

6.1.1 The following page limits of the postgraduate theses have been suggested by the Departmental BPGS (Meeting No. Physics/BPGS/2021/2nd, 14 March 2021):

Ph. D. Thesis: ~ **150 pages**

M. Phil. Thesis: ~ **100 pages**

M. Sc. Thesis: ~ **100 pages**

Ph. D. Progress Report: ~ **50-60 pages**

Chapter 2 (Literature Review and Theoretical Aspects) and Chapter 3 (Materials and Methods) of the thesis should be ~ 30 pages in total. If more pages are required for the results and discussion chapter, then the above-mentioned page limit could be relaxed.

6.1.2 The following sequences should be followed as standard format for the thesis/project report (Postgraduate Ordinance, A.C. Meeting No. 351, 19 June 2007)

(i) **A blank page**

(ii) **Title Page:** The student should follow the following instruction for title page (section 6.1.4):

a) The title of the thesis should appear in 12-point boldface upper and lower case letters.

b) The word 'by' should be in lower case letters.

c) 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 University records.

d) Write out the full name of the degree in **12 points** uppercase letters for which the research work is presented, e.g., DOCTOR OF PHILOSOPHY, MASTER OF PHILOSOPHY IN PHYSICS. MASTER OF SCIENCE IN PHYSICS.

e) Write down your department name in full e.g., Department of Physics in **12 points** upper- and lower-case letters.

f) Type in BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY in **12 points** uppercase letters.

g) Write down Month and Year of the defense in **12 points** upper- and lower-case letters.

(iii) **Copyright page:** This part is optional to the candidate.

(iv) **Certification page of Thesis/Project Report Approval:** The Approval page of Thesis/Project Report Approval should be as per the format in section 6.2, 6.3 and 6.4.

(v) **Declaration Page:** The Declaration page should be as per the format in section 6.5.

(vi) **Preface, dedication, and/or acknowledgement pages:** Preface and dedication are optional. The student should acknowledge advice, service encouragement, library and information service support and source of financial support.

(vii) **Abstract**: An abstract is to be included in each thesis. The abstract may not exceed 350 words for a Thesis of Ph. D. or 150 words for a Thesis/Project of Masters or Postgraduate Diploma. The abstract should be a miniature version of the thesis and should contain summary of the

results, conclusions and main arguments presented in the thesis.

(viii) **Table of Contents with page references:** This includes Individual listing of preliminary pages (Preface, dedication, acknowledgement, etc)**,** List of chapter and section headings, Appendices, Bibliography or References. 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.

(ix) **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.

(x) **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 such as Abbreviations published by the American Standards Association and other information sources available in the Central Library. These abbreviations are also frequently found listed at the back of standard texts on technical writing.

(xi) **Main Body of Text:** 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.

(xi) **References/Bibliography:** Notes and bibliography/references should be typed in single spacing. A blank line must be used between references. A numbered list of references must be provided at the end of the thesis, before any appendices. The list should be numbered either in the order of citation in the text, or in alphabetical order and there should be only one reference number. Each reference number should be enclosed in square brackets. In text, citation of references may be given simply as "in [1]…"; rather than "in reference [1]…". Some examples are shown in section 6.1.5.

(xii) **Appendices:** Appendices are included to provide detailed information that would otherwise detract the readability of the main body of the text. Computer programs, lengthy tables and detailed laboratory procedures etc. are a few examples of material to be included in the Appendix. Appendices must be paginated in accordance with the text. All tables and figures in the Appendices must be appropriately labeled and listed in the Lists of Tables and Figures.

(xii) **Blank pages (two)**

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

(i) **Size and Thickness of Paper:** Thesis/project is to be printed on A4 size quality offset paper and bonded paper weighing between 70 and 80 gsm.

(ii) **Typing or Print:** A quality printer should be used for printing the final copies of the thesis. The acceptable fonts **(12 points)** are Times New Roman or similar serif fonts, and Arial, or similar sans serif fonts. Times New Roman font is preferred. The text should be justified.

(iii) **Margins of Text:** Text printed on single-sided paper, top, bottom and right margins 25 mm from the edge of the paper and left margin 35 mm from the edge of the paper.

(iv) **Page Numbering:** The preliminary pages preceding the main text of the thesis carry consecutive lower-case Roman numerals, centered at the lower margin of the page. The Title page is unnumbered but carries the implied number "i". The text carries consecutive Arabic numbers positioned in the upper right-hand corner. The pages at the beginning of the chapter do not show the page number.

(v) **Format of the Main Body of the Text:** Chapter titles should be centered bold 14 points. Text in the chapter titles should be in upper case. Secondary headings should be flush left 12 points bold. The first letter in each word of the secondary heading should be capitalized. Third level headings should be flush left 12 points bold. Only the first letter of the first word of the third level should be capitalized.

In the case of the paragraph starting left justified, there should be a spacing between the paragraphs. Otherwise, the paragraphs may be indented by a consistent amount.

(vi) **The font, point size, positioning, numbering, and referencing of equations:** The typeface for equations will be 12 points Times New Roman and are to be numbered sequentially by chapters (right justified). Reference for equation numbers in the text should be enclosed in parentheses, such as (5.2). All equations, however, need not be numbered – that is at the discretion of the author. 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.

(vii) **The layout and numbering of figures and tables and their captions:** Figures should be centered between the left and right margin with their captions centered below the figure in point size 12 Times New Roman single spaced. Figures should be consecutively numbered per chapter. The word Figure may be abbreviated as "Fig.". Tables should be centered between the left and right margin with their captions (12 points Times New Roman) centered above the table. Tables should be consecutively numbered per chapter. Main heading and number of Figures and Tables should be bold.

(viii) **Computer Disk:** If a student wishes to include computer disks as a part of his data, he must submit a disk for each required copy of his thesis. These must be submitted loosely. It is not necessary to submit them at the time he scheduled his defense. 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 computer disks in his Table of Contents.

(ix) **Binding and Colour:** The thesis/project report should be sewn and bound in strong, waterproof cloth. The colour of the cloth should be Maroon for Ph. D., Black for M. Phil. and M. Sc. degrees, respectively.

The lettering in all cases will be in golden colour, center justified. The cover should include the Title of the thesis/project. Author's name and Department.

The following items should be written on the spine of the thesis/project report: Name of the degree (in abbreviated form) at the top, Name of the Author (initials and surname) in the middle, and year of defense at the bottom of the spine. All letters should in golden letters.

6.1.4 Format of the Title page:

	Format/Font
Title of the Thesis/Project Report	12 Point Bold, Upper and lowercase letters
by	12 Pt lowercase letters
The name of the Author	12 Point Upper and lowercase letters
NAME OF THE DEGREE	12 Point Uppercase letters
Name of the Department/Institute	12 Point Upper and lowercase letters
BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY	12 Point Uppercase
Month and year of the defense	12 Point Upper and lowercase letters

6.1.5 Reference format:

Books:

[1] Borgnakke, C., ″Flame Propagation and Heat-Transfer Effects in Spark-Ignition Engines,″ in J. C. Hilliard and G. S. Springer (eds.). *Fuel Economy in Road Vehicles powered by Spark Ignition Engines*, chap. 5, pp. 183-224, Plenum Press, New york, 1984.

[2] Farrelly, D. (1966) *The book of bamboo.* Thames and Hudson Ltd., London.

Periodicals:

[3] Benson, R. S., Garg, R. D., and Woolatt, D., ″A Numerical Solution of Unsteady Flow Problems,″*Int. J. Mech. Sci*.,vol. 6, pp. 117-144, 1964.

[4] N. R. Dhar, S. Paul and A. B. Chattopadhyay, (2000) ″Role of Cryogenic Cooling on Cutting Temperature in Turning Steel″, Trans. of the ASME, Journal of Manufacturing Science and Engineering, Vol. 123, pp. 1-9.

Articles from published conference proceedings:

[5] Nichols, M. A., Siegel, H. J., Dietz, H. G., Quong, R. W., and Nation, W. G., ″Minimizing memory requirements for partitionable SIMD/SPMD machines,″ in *1990 International Conference on Parallel Processing*, Vol. I, Aug. 1990, pp. 84-91.

Papers presented at conferences (unpublished):

[6] Ebehard, D., and Voges, E., ″Digital single sideband detection for interferometric sensors,″ presented at 2nd Int. Conf. Optical Fiber Sensors, Stuttgart, F.R.G., 1984.

Reports:

[7] Reber, E. E., Mitchell, R. L., and Carter, C. J., ″Oxygen absorption in the earth′s atmosphere,″ Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1968.

[8] GOB (1993) *National housing policy 1993*. Government of Bangladesh, Ministry of Housing and Public Works, Dhaka.

Theses:

[9] Rahman, M. A., *The Structure of Turbulent Mixing Layers*, M. Sc. Engg. Thesis, Department of Mechanical Engineering, Bangladesh University of Engineering and Technology, 1998.

6.2 Certification for M. Phil./M. Sc. Degree

The thesis titled ……..
……

Submitted by …… Roll. No ……..
Session ……. has been accepted as satisfactory in partial fulfillment of the requirement for the degree of MASTER OF PHILOSOPHY IN PHYSICS/MASTER OF SCIENCE IN PHYSICS on …….. (date) ……..…….

BOARD OF EXAMINERS

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

6.3 Certification of Comprehensive Examination

On the basis of the report and the oral examination held in the Department of Physics, BUET, Dhaka on ……..…., the performance of ……..……, bearing Roll ……..…… of Session: …….. was found satisfactory. The Examination Committee recommends that ……, formally be registered as a Ph. D. student of the Department of Physics. The following members of the Doctoral Committee (Approved by CASR Meeting No. ……., Agendum No. ……., Dated ……..) were present.

BOARD OF EXAMINERS

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

6.4 Certification for Ph. D. Degree

The thesis titled …….
……

Submitted by …… Roll. No ……..

Session …… has been accepted as satisfactory in partial fulfillment of the requirement for the degree of DOCTOR OF PHILOSOPHY on …….. (date) ……

BOARD OF EXAMINERS

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

6.5 Declaration of Student

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

6.6 Open Seminar and Oral Examination

6.6.1 The open seminar must be arranged by the Department for the students before their final defense. According to BPGS (Meeting No. Physics/BPGS/2020/7th, 20 September 2020), the rules for the open seminar and final defense are as follows:

i) The students should submit their final thesis to the Head of the Department **at least** seven days before the open seminar. The thesis will be disseminated to all participants during the seminar.

ii) Final thesis of M. Sc./M. Phil. degree and progress report of Ph. D. should be provided to the members of the board of examiners **at least** seven days before the final defense.

iii) Ph. D. students should start writing their thesis with the approval of the doctoral committee. A final thesis of Ph. D. should be submitted to the members of the board of examiners **at least** 15 days prior to the final defense.

6.6.2 Duration of open seminar/oral thesis presentation must be considered as follows:

M. Sc. Thesis Presentation: ~ 30 minutes

M. Phil. Thesis Presentation: ~ 40 minutes

Ph. D. Thesis Presentation: ~ 50 minutes

Ph. D. Progress Report Presentation: ~ 40 minutes

6.6.3 The Postgraduate students of the Department of Physics are instructed to focus on the following guidelines during their open seminar/oral thesis presentation.

(i) **Introduction:** It must include the statement of the problem, present state/literature, limitation of the current state of the art (if any), objectives and outcome.

(ii) **Methods and Techniques**: This part must include the methodology, equipment (if the research is experimental), data collection methods, working principle of any equipment (if applicable).

(iii) **Results and Discussion:** This part should include the most important results, the major findings with explanations based on his/her research or existing theories and the limitations of the findings if any.

(iv) **Conclusions:** This part should include the consequences/messages/implications as a concluding remark based on major findings of the thesis and suggestions for further investigation required to complete this investigation or to understand the mechanism.

(v) **List of Publications:** The publication list should be mentioned chronologically by month and year.

(vi) **Acknowledgements:** Acknowledgement to the laboratories, financial supporting authorities and persons who contributed in his/her work must be included briefly.

*Note that the details of the guidelines are available in the departmental website (*https://phy.buet.ac.bd/*).*

Department of Physics

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