



Prospectus 2010

BRAC UNIVERSITY



**undergraduate
programs**



Prospectus 2010



Editorial Committee

Dr. Wasiquir Rahman Khan
Ms. Nausheen Eusuf
Ms. Afroza Sultana
Mr. Monojit Kumar Ojha
Mr. Md. Arifuzzaman
Mr. Md. Khaleq Newaz

Copyright © 2009 BRAC University

October 2009

Publisher:

BRAC University
66, Mohakhali
Dhaka 1212, Bangladesh

Telephone: (88 02) 882 4051-4 (PABX)

Fax: (88 02) 881 0383

E-mail: info@bracu.ac.bd

Website: www.bracu.ac.bd

Layout & Illustration: *Md. Shahidul Islam*

Cover design: SpellBound

Printing: BRAC Printers, Tongi, Gazipur

Table of Contents

Vice Chancellor's Message	v
General Information	vii
Governance	ix
Academic Council	x
Administration and Management	xi
Schools, Departments, Institutes & Centre	xiii
Partners in Education	xviii
Resources, Facilities and Services	
Resources at BRACU	xx
Facilities for Learning	xxi
Student Activities	xxvi
Academic System	xxix
Admissions	
Minimum Qualification for Applying	xxxiii
Application for Admission	xxxiii
Fee Structure	xxxiv
Refund Policy	xxxv
ACADEMIC PROGRAMS	1
DEPARTMENTS	
Department of Architecture	1
Bachelor of Architecture (B. Arch.)	1
Department of English & Humanities	7
Bachelor of Arts (BA) in English	7
Department of Economics & Social Sciences	12
Bachelor of Social Science (BSS) in Economics	12
Department of Mathematics & Natural Sciences	18
Bachelor of Science (BS) in Physics	18
Bachelor of Science (BS) in Applied Physics and Electronics	22
Bachelor of Science (BS) in Mathematics	25
SCHOOLS	
BRAC Business School	30
Bachelor of Business Administration (BBA)	30
School of Engineering & Computer Science	38
Department of Computer Science & Engineering	38
Bachelor of Science (BS) in Computer Science	38
Bachelor of Science (BS) in Computer Science and Engineering	42
Department of Electrical & Electronic Engineering	45
Bachelor of Science (BS) in Electronics and Communication Engineering	45
Bachelor of Science (BS) in Electrical and Electronic Engineering	48

School of Law	52
Bachelor of Laws (LLB)	52
CENTRE	
Centre for Languages	57
<i>DESCRIPTION OF COURSES</i>	
Bachelor of Architecture (B. Arch)	61
Bachelor of Arts (BA) in English	70
Bachelor of Social Science (BSS) in Economics	79
Bachelor of Science (BS) in Applied Physics and Electronics	90
Bachelor of Science (BS) in Mathematics	94
Bachelor of Science (BS) in Physics	104
Bachelor of Business Administration (BBA)	117
Bachelor of Science (BS) in Computer Science	129
Bachelor of Science (BS) in Computer Science and Engineering	129
Bachelor of Science (BS) in Electronics and Communication Engineering	137
Bachelor of Science (BS) in Electrical and Electronic Engineering	137
Bachelor of Laws (LL.B)	155



Vice Chancellor's Message

Welcome to BRAC University! Selecting a university and the major field(s) of study are among the most important decisions that you will ever have to make. As you browse through this prospectus I hope it will assist you making a choice.

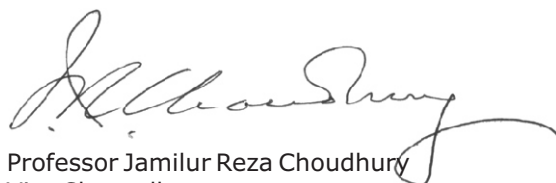
Since its inception in April 2001, BRACU has attained a reputation for providing quality education in different disciplines. You will find an extensive selection of courses, a helpful environment and committed teachers and staff. Through continuous improvements in our curricula and developments in our learning facilities and resources we try to ensure that you receive the best education and experience a memorable university life.

The underlying philosophy of BRAC University is to develop ethical graduates, who will grow as individuals, gaining in self-confidence and developing a sense of leadership. Through a vibrant and rewarding campus life with diversity of co-curricular and extra-curricular activities, we try to make BRACU a truly learning community.

We are committed to your success and we put your personal and academic development as our number one priority. BRACU is the only private university in the country to provide a residential semester. Through different courses offered and co-curricular programs organized during the residential semester in the relatively quiet environment away from the city, we aim to develop self-confidence, adaptability, team work and enhanced communication skills in students.

The strength of BRACU breeds from the unique strengths and contributions of our faculty and staff and our distinctive pedagogical approach that culminates in all-rounded students ready for this dynamic society and the ever changing job market.

I hope you will make the best use of our educational facilities.



Professor Jamilur Reza Choudhury
Vice Chancellor



BRAC UNIVERSITY

boichit

Intra University Football Tournament

BOICHIT

UNIVERSITY ALUMNI
uni.bracu
LTD

GENERAL INFORMATION

About BRAC University

BRAC University was established by BRAC in 2001. From a modest beginning in 1972, BRAC has grown into one of the largest non-government development organizations in the world. It works in a number of closely related areas such as poverty alleviation, rural health care and non-formal education among many others to bring about socio-economic changes for a large number of our people, mostly women and children, whose lives are dominated by extreme poverty, illiteracy, disease and malnutrition. BRAC continually revisits its approaches to ensure its effectiveness as a catalyst for change. BRAC recognizes that development strategies, information technology and effective management can play significant roles in modernizing Bangladesh and in securing meaningful jobs for the Bangladeshi workforce at home and abroad.

In line with BRAC's continued support to education as a force of change and development, BRAC University has been established to provide a high quality of education to meet the demands of the modern age. BRAC University is 'not for profit' institution accredited by the University Grants Commission (UGC) and approved by the Ministry of Education, Government of Bangladesh.

Mission

The mission of the BRAC University is to foster the national development process through the creation of a centre of excellence in higher education that is responsive to society's needs, and able to develop creative leaders and actively contributes to learning and creation of knowledge.

Goal

The goal of the university is to provide an excellent broad based education with a focus on professional development for students, in order to equip them with the knowledge and skill necessary for leading the country in its quest for development. Along with this, the university provides an environment for faculty development in order to ensure a dynamic teaching environment. Faculty will be provided with an environment in which they can further their teaching skills and contribute to the creation of new knowledge by developing and using their research skills.

Scope

At present, the university offers following undergraduate degrees:

Bachelor of Architecture (B. ARCH), Bachelor of Business Administration (BBA), Bachelor of Science (BS) in Computer Science and Engineering (CSE), Bachelor of Science (BS) in Computer Science (CS), Bachelor of Science (BS) in Electronics & Communication Engineering (ECE), Bachelor of Science (BS) in Electrical and Electronic Engineering (EEE), Bachelor of Science (BS) in Physics, Bachelor of Science in Applied Physics and Electronics, Bachelor of Science in Mathematics, Bachelor of Laws (LL.B Hons), Bachelor of Social Science (BSS) in Economics and Bachelor of Arts (BA) in English.

The University offers following postgraduate degrees:

Master of Science (M.Sc) / Master of Engineering (M.Engg.) in Electrical and Electronic Engineering, Master of Business Administration (MBA), Executive MBA (EMBA), Master of Development Studies (MDS), Master of Bank Management (MBM), Master of Science in Biotechnology, Master of Disaster Management (MDM), Master of Arts (MA) in English, Master of Science in Applied Economics (MSAE), Master of Arts in Governance and Development (MAGD), Master of Public Health (MPH), Master of Education (MEd) and Master's in Early Childhood Development (MECD).

BRAC University also offers Postgraduate Diplomas in Disaster Management, Development Studies and Certificate courses in Disaster Management, ICT and Development, Social Communication, CISCO Certified Network Associate (CCNA), English Proficiency and Development, and IELTS (Preparatory)

As the university grows and as its institutional capacity is built up, the University will offer programs in a large number of disciplines. BRAC University will provide instruction and confer degrees in all branches of Arts, Social Science and Science including Medicine, Engineering, Architecture, Agriculture, etc. Degrees will be granted at the undergraduate, graduate and postgraduate (doctoral) levels. In addition, the University will offer Diploma programs on professional courses.

Organizational Structure

The Honorable President of the People's Republic of Bangladesh is the Chancellor of BRAC University. The Governing Board is the highest policy making body of BRAC University and is responsible for ensuring the highest level of educational and administrative standard at BRAC University. A number of committees assist the Board in matters essential to the smooth functioning of the University. The committees are: Academic Council, Course Committee, Finance Committee, Selection Committee, Audit Committee, Committee on Student Affairs, Disciplinary Committee, Committee on University Development and Committee on Medical Facilities. The Vice Chancellor (VC) is the Chief Executive and Academic Officer of the University. He is assisted by the Pro-Vice Chancellor in all relevant matters. The academic wing of the University consists of Deans of Faculties/Schools, Chairpersons of the Departments and Faculty Members. The Director of Student Affairs co-ordinates and supports all extra-curricular activities. The Librarian who is assisted by a Deputy Librarian and Assistant Librarians head the University library. The Registrar with Deputy Registrar, Assistant Registrar and Officers are responsible for day-to-day administration, human resource management, technological services and records.

GOVERNANCE

Chancellor

Mr. Md. Zillur Rahman

Hon'ble President, People's Republic of Bangladesh

Vice Chancellor

Professor Jamilur Reza Choudhury

Treasurer

Mr. Sukhendra Kumar Sarkar

Pro-Vice Chancellor

Professor Md. Golam Samdani Fakir

Registrar (a.i.)

Mr. Sukhendra Kumar Sarkar

Governing Board

The Governing Board is the highest policy making body of BRACU. It is responsible for ensuring that the highest level of educational and administrative standards are set and maintained at BRACU. The current Governing Board consists of the following eminent personalities of Bangladesh:

President

Mr. Fazle Hasan Abed

Founder & Chairperson, BRAC

Advocate Sultana Kamal

Executive Director

Ain O Salish Kendro (ASK)

Members

Professor Jamilur Reza Choudhury

Vice Chancellor

BRAC University

Professor Dilara Chowdhury

Department of Government and Politics

Jahangir Nagar University

Professor Md. Golam Samdani Fakir

Pro-Vice Chancellor

BRAC University

Mr. Abdul-Muyeed Chowdhury

Chairman

BRAC Net

Mr. Faruq Ahmed Choudhury

Former Foreign Secretary

Ministry of Foreign Affairs

Mr. Sukhendra Kumar Sarkar

Treasurer

BRAC University

Professor Anisuzzaman

Professor Emeritus

Dhaka University

Dr. Mahabub Hossain

Executive Director

BRAC

Professor Ainun Nishat

Country Representative, International Union
for Conservation of Nature (IUCN)

Member Secretary

Mr. Sukhendra Kumar Sarkar

Registrar (a.i.)

BRAC University

Academic Council

The Academic Council recommends the educational policies of the university and determines the curricula and courses that can help achieve high educational standards. The council is currently composed of the following academics and professionals:

Chairperson

Professor Jamilur Reza Choudhury
Vice Chancellor
BRAC University

Members

Professor Md. Golam Samdani Fakir
Pro-Vice Chancellor
BRAC University

Professor Iqbal Mahmud
Former Vice Chancellor, BUET

Professor Ainun Nishat
Country Representative
International Union for Conservation of
Nature (IUCN)

Mr. Khalid Shams
"REEMA", 10 Eskaton Garden Road
Ramna, Dhaka-1000

Mr. Mamun Rashid
CEO, Citi Bank, NA

Mr. Mahbub Jamil
Chairman & Managing Director
Singer Bangladesh Ltd.

Mr. Emad-Ul-Ameen
Director, Human Resource
GrameenPhone Ltd.

Dr. Perween Hasan
Professor of Islamic History and Culture
Dhaka University

Professor Zarina Rahman Khan
Department of Public Administration
Dhaka University

Professor Fuad Hassan Mallick
Chairperson
Department of Architecture
BRAC University

Professor Sayeed Salam
Chairperson, Electrical & Electronic
Engineering, BRAC University

Professor Mumit Khan
Chairperson, Computer Science &
Engineering, BRAC University

Professor Firdous Azim
Chairperson, English & Humanities
BRAC University

Dr. Anwarul Hoque
Chairperson, Economics & Social Sciences
BRAC University

Professor A. A. Ziauddin Ahmad
Chairperson
Mathematics and Natural Sciences
BRAC University

Dr. Sanaul Mostafa
Director, BRAC Business School
BRAC University

Dr. Shahdeen Malik
Director, School of Law
BRAC University

Mr. Kh. Shamsuddin Mahmood
Head, Undergraduate Program
School of Law, BRAC University

Professor Anwar Islam
Director, James P. Grant School of Public
Health, BRAC University

Professor Syed M Hashemi
Director, BRAC Development Institute
BRAC University

Ms. Erum Mariam
Director, Institute of Educational
Development, BRAC University

Barrister Manzoor Hasan
Director
Institute of Governance Studies
BRAC University

Ms. Syeda Sarwat Abed
Director, Centre for Languages
BRAC University

Member Secretary

Mr. Sukhendra Kumar Sarkar
Registrar (a.i)
BRAC University

Administration and Management

Professor Jamilur Reza Choudhury
Professor Md. Golam Samdani Fakir
Mr. Sukhendra Kumar Sarkar

*Vice Chancellor
Pro-Vice Chancellor
Treasurer & Registrar (a.i)*

Vice Chancellor's Office

Mr. Obaidullah Al Zakir
Ms. Rofequnnesa Amin

*Assistant Director, PRELO
Secretary to the VC*

Office of the Registrar

Mr. Sukhendra Kumar Sarkar
Ms. Iris Pervin
Mr. Md. Arifuzzaman
Ms. Nazmus Sabeka
Ms. Shadia Alam
Mr. Mohammad Shamim Azad

*Registrar (a.i)
Assistant Registrar
Senior Registration and Program Officer
Assistant Registrar, Examination & Transcript
Examination & Transcript Officer
Admission and Registration Officer*

Students Affairs

Professor Dr. Zainab F. Ali
Mr. Mohammad Jahangir Alam
Mr. Md. Kamruzzaman

*Director
Assistant Director
Student Affairs Officer*

Accounts Office

Mr. Monojit Kumar Ojha
Mr. Amdadul Islam
Mr. Azharul Islam Bhuiyan
Mr. Sumon Chandra Das
Mr. Md. Golam Kibria
Ms. Nusrat Zahan
Mr. Md. Humayun Bashar
Mr. Mohammad Khorshed Alam

*Head of Accounts
Senior Accounts Officer
Senior Accounts Officer
Accounts Officer
Accounts Officer
Junior Accounts Officer
Accounts Officer
Accounts Officer*

Relationship Management Office

Ms. Shamsun Nahar Rahman
Mr. Saiduzzaman Shikder
Ms. Zinia Khanam

*Assistant Director
Student Counselor
Junior Student Counselor*

Human Resources Office

Ms. Rosy Sharif
Ms. Momena Begum
Ms. Tanvia Ifrat

*Senior Human Resource Officer
Human Resource Officer
Human Resource Assistant*

Career Services Office

Ms. Sabrina Shahidullah
Mr. Ziaul Haq
Mr. Md. Shorab Hossain

*In-charge
Career Services Officer
Assistant Administrative Officer*

IT Systems Office

Mr. Mohammad Hossain
Ms. Fahima Khanam
Mr. Mohammad Rezaul Islam
Mr. Aminul Islam
Mr. Md. Sadat Mursalin Chowdhury
Mr. Md. Al-Mahmud
Mr. Aurongojeb

*Senior System Administrator
Senior System Administrator
System Administrator
System Administrator
Assistant System Administrator
Assistant System Administrator
Network Support Engineer*

Administration Office

Mr. Md. Nurul Islam
Mr. Md. Shahidul Islam
Mr. Sk. Tareq Hossain
Mr. Md. Akterujjaman
Mr. Muhammad Shahjahan
Ms. Israt Sultana

*Senior Administrative Officer
Administrative Officer
Maintenance/Administrative Officer
Administrative Officer
Campus Supervisor
Telephone Operator*

Procurement Office

Mr. Abdul Moghni Chowdhury
Mr. Md. Mahbub Alam
Mr. Mahabub-Bin-Zaman

*Procurement Manager
Procurement Officer
Procurement & Administrative Officer*

Medical Center

Dr. Afroza Jesmin
Ms. Alo Clara Gomes

*Medical Officer
Resident Nurse (Savar)*

Students Counseling Office

Ms. Mahbuba Naznin Sani

Counselor

Savar Campus

Mr. Md. Mahfuzul Bari Chowdhury
Mr. Biplab Kumar Halder
Mr. Ahammad Ullah
Ms. Anjuman Ara
Mr. Faruk Hossain
Ms. Umme Salma Akhtar
Ms. Robaet Nusrat Jahan
Mr. Rehan Ahmed
Mr. Md. Saddam Hossain
Mr. Halal Rabbani
Mr. Jasim Uddin Bhuiyan
Mr. Kamal Pasha
Mr. Bikash Kumar Biswas
Mr. Md. Moniruzzaman

*Campus Superintendent
Lecturer cum House Tutor
Lecturer cum House Tutor
Counselor
Admin Officer (Coordination-RS)
House Tutor
House Tutor
Dorm Supervisor
Lab Technical Officer
Assistant Librarian
House Tutor
House Tutor
House Tutor
Lab Technical Officer*

Ayesha Abed Library

Ms. Hasina Afroz
Ms. Syeda Nasima Begum
Mr. Kh. Ali Murtoza
Mr. Md. Ahmad Parvez
Mr. Asim Dio
Ms. Sajia Sultana

*Deputy Librarian (Head of Library)
Senior Assistant Librarian
Senior Assistant Librarian
Assistant Librarian
Junior Assistant Librarian
Junior Assistant Librarian*

Schools, Departments, Institutes & Centre

BRAC BUSINESS SCHOOL

Dr. Sanaul Mostafa
 Professor Dr. Mojib U. Ahmed
 Mr. Mahmudul Haq
 Mr. Zahidul Alam Khandaker
 Mr. Shawkat Kamal
 Ms. Afsana Akhter
 Mr. Suntu Kumar Ghosh
 Mr. Md. Zakir Hossain Sharkar
 Mr. Anup Chowdhury
 Mr. Mohammad Khaleq Newaz
 Mr. Suman Paul Chowdhury
 Ms. Syeda Rownak Afza
 Mr. Shamim Ehsanul Haque
 Mr. Probal Dutta
 Ms. Syeda Shaharbanu Ahmed
 Ms. Shireen Abedin
 Ms. Somaiya Yunus
 Ms Sharmin S. Rahman
 Ms. Farhana Nur Malik
 Ms. Kohinur Akter
 Mr. Dewan Mostafizur Rahman
 Mr. Mostak Ahmed
 Mr. Jabed Rasel
 Mr. Satyajit Modak

Director
Director, MBA Program
Assistant Professor
Assistant Professor
Senior Lecturer
Senior Lecturer
Senior Lecturer
Senior Lecturer
Senior Lecturer
Senior Lecturer
Lecturer
Senior Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Department Coordination Officer
Department Coordination Officer
Department Coordination Officer

SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

Department of Computer Science and Engineering

Professor Dr. Mumit Khan
 Dr. Md. Khalilur Rhaman
 Dr. Al-Sakib Khan Pathan
 Ms. Sadia Kazi
 Mr. Matin Saad Abdullah
 Ms. Bushra Tawfiq Chowdhury
 Mr. Abdussamad Ahmed Muntahi
 Mr. Sarwar Alam
 Mr. Imran Ahmed
 Ms. Afroza Sultana
 Mr. Farazul H. Bhuiyan
 Mr. Ahmedul Kabir
 Mr. Md. Omar Faruque
 Mr. Annajiat Alim Rasel
 Ms. Effat Jahan Mila

Chairperson
Assistant Professor
Assistant Professor
Senior Lecturer
Senior Lecturer
Senior Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Junior Lecturer
Department Coordination Officer

Department of Electrical & Electronic Engineering

Professor Dr. Md. Sayeed Salam
 Dr. AKM Abdul Malek Azad
 Ms. Amina Hasan Abedin
 Mr. Tarem Ozair Ahmed
 Ms. Marzia Alam
 Mr. Nazmus Saquib
 Ms. Rumana Rahman
 Mr. Apurba Saha
 Mr. Supriya Shafkat Ahmed
 Mr. Mehedi Zahid Sadi

Chairperson
Associate Professor
Senior Lecturer
Senior Lecturer
Lecturer
Lecturer
Junior Lecturer
Junior Lecturer
Junior Lecturer
Lecturer

Mr. Radwanul Hasan Siddique
Ms. Fariah Mahzabeen
Ms. Effat Jahan Mila

*Lecturer
Junior Lecturer
Department Coordination Officer*

SCHOOL OF LAW

Dr. Shahdeen Malik
Mr. K. Shamsuddin Mahmood
Dr. Saira R Khan
Ms. Tureen Afroz
Mr. Mahmudul Karim
Ms. Christine Richardson
Ms. Romin Tamanna
Ms. Munira Jahan Sumi
Mr. Rayhanul Haque

*Director
Head, Undergraduate Program
Assistant Professor
Assistant Professor
Lecturer-II
Visiting Faculty
Junior Lecturer
Teaching Assistant
Department Coordination Officer*

SCHOOL OF PUBLIC HEALTH

Dr. Alejandro Cravioto
Dr. Anwar Islam
Dr. Shahaduz Zaman
Dr. Sabina F Rashid
Mr. Shafiun Nahin Shimul
Ms. Nasima Selim
Dr. Farah Mahjabeen
Dr. Golam Enamul Hasib Chowdhury
Mr. Tapan Biswas
Dr. Dina Siddiqi
Mr. Steve Luby
Dr. Tahmeed Ahmed
Dr. Shams El- Arefeen
Mr. Tracey Koehlmoos
Mr. Mizanur Rahman
Mr. Aftab Uddin
Dr. Abbas Bhuiyan
Mr. Mrityunjoy Das

*Acting Dean
Director
Associate Professor
Associate Professor
Lecturer
Lecturer
Lecturer
Research Associate
Program Officer, IT
Visiting Faculty
Adjunct Professor
Adjunct Professor
Adjunct Professor
Adjunct Professor
Adjunct Lecturer
Adjunct Faculty
Adjunct Professor
Academic & Administrative Officer*

DEPARTMENTS

Department of Architecture

Professor Dr. Fuad Hassan Mallick
Professor Dr. Zainab F. Ali
Ms. Sheikh Rubaiya Sultana
Ms. Huraera Jabeen
Mr. Khondaker Hasibul Kabir
Mr. Sajid-bin-Doza
Mr. Abu Muhammad Rahat Mujib Niaz
Mr. Muhammad Nafisur Rahman
Mr. Md. Shajjad Hossain
Mr. Md. Shafiqul Alam
Mr. Shams Mansoor Ghani
Dr. S. I. Khan
Mr. Md. Aminur Rahman
Ms. Tahmina Rahman
Ms. Tanjina Khan
Ms. Rabeya Rahman
Mr. Samiur Rahman Tushar
Mr. Md. Lutfor Rahman

*Chairperson
Director, Student Affairs
Senior Lecturer
Senior Lecturer
Senior Lecturer
Senior Lecturer
Lecturer
Lecturer
Lecturer-II
Lecturer
Visiting Faculty
Lecturer
Research Assistant
Teaching Assistant
Teaching Assistant
Teaching Assistant
Department Coordination Officer*

Postgraduate Programs in Disaster Management

Professor Dr. Fuad Hassan Mallick
Dr. S. I. Khan
Mr. Mohammad Aminur Rahman
Ms. Tahmina Rahman

Director
Visiting Faculty
Lecturer
Research Assistant

Department of English and Humanities

Professor Dr. Firdous Azim
Professor Dr. Syed Manzoorul Islam
Ms. Rukhsana Rahim Chowdhury
Mr. Mohammad Mahmudul Haque
Ms. Asifa Sultana
Ms. Roohi Huda
Ms. Tamanna Mostafa
Ms. Shenin Ziauddin
Ms. Sanam Amin
Ms. Rubana Ahmed
Mr. Md. Nazmul Hossain Bhuiyan

Chairperson
Visiting Faculty
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Teaching Assistant
Teaching Assistant
Department Coordination Officer

Department of Economics and Social Sciences

Professor Dr. Anwarul Hoque
Dr. Manjur Karim
Dr. Mohammad Alauddin
Dr. Minhaj Uddin Mahmud
Dr. Wasiqur Rahman Khan
Dr. Shahidur Rahman
Dr. Farzana Munshi
Mr. Mohammad Jahangir Alam
Mr. Md. Abdul Wohab
Ms. Mahbuba Naznin Sani
Mr. Naim Uddin H. A. Chowdhury
Ms. Fahmida Saadia Rahman
Mr. Iftekharul Haque
Ms. Takrima Sayeda
Ms. Meheri Tamanna
Mr. Haydory Akbar Ahmed
Ms. Nirvana Mujtaba
Ms. Sarah Salahuddin
Ms. Lutfun Nahar Lata
Mr. Fahim Subhan Chowdhury
Mr. Theophil Nokrek

Chairperson
Associate Professor
Visiting Professor
Associate Professor
Assistant Professor
Assistant Professor
Senior Lecturer
Senior Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Research Associate
Department Coordination Officer

Department of Mathematics and Natural Sciences

Professor Dr. A. A. Ziauddin Ahmad
Professor Dr. Naiyyum Choudhury
Professor Dr. Mofiz Uddin Ahmed
Dr. Mezbahur Rahman
Dr. Aparna Islam
Dr. Mohammad Rafiqul Islam
Ms. Sharmina Hussain
Mr. Md. Jakir Hossen
Mr. Iftekhar Md. Shafiqul Kalam
Ms. Moushumi Zahur
Ms. Fardousi Ara Begum
Mr. Mahabobe Shobahani
Ms. Hasibun Naher
Ms. Sanjida Aktar
Mr. Al Amin Kabir

Chairperson
Coordinator, Biotechnology
Visiting Faculty
Visiting Faculty
Assistant Professor
Assistant Professor
Assistant Professor
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer

Ms. Lopamudra Chakravarty
 Mr. Kh. Md. Mahmudul Hasan
 Mr. Muhammad Lutfur Rahman
 Mr. Md. Ashraful Islam Bhuiyan
 Ms. Adiba Raihan
 Mr. Shahin Shaikh

Lecturer
Lecturer
Teaching Assistant
Teaching Assistant
Teaching Assistant
Department Coordination Officer

INSTITUTES

BRAC Development Institute

Professor Dr. Syed M Hashemi
 Dr. Ferdous Jahan
 Mr. Khondoker Shakhawat Ali
 Mr. Afzal Aftab
 Ms. Samia Haq
 Ms. Syeda Jaferi Hussain
 Ms. Sadeka Banu

Director, DSP
Academic Coordinator
Communications Coordinator
IT Officer
Senior Research Associate
Communication Associate
Department Coordination Officer

Institute of Educational Development

Dr. Erum Mariam
 Dr. Manzoor Ahmed
 Ms. Kaniz Fatema
 Dr. Sudhir Chandra Sarker
 Ms. Mary Monica Gomes
 Mr. Mohammad Zia-Us-Sabur
 Ms. Trishna Sagar
 Ms. Laila Farhana Apnan Banu
 Mr. Kazi Sameeo Sheesh
 Ms. Dilruba Sultana
 Ms. Rino Wiseman Adhikary
 Ms. Sumera Ahsan
 Ms. Fahmida Naznin
 Ms. Mahmuda Akhter
 Dr. Nishat Fatima Rahman
 Mr. Md. Altaf Hossai
 Ms. Shaheen Akter
 Mr. Vibekananda Howlader
 Mr. Md. Kabir Tafiqul Islam
 Mr. Jamil Ahmed
 Ms. Ratna Guha
 Ms. Basabi Maksud
 Mr. Spencer Tapu Mitra
 Ms. Foujia Nahid
 Mr. Dipankar Kumar Chowdhury

Director
Senior Adviser
Education Adviser
Programme Coordinator
Senior Faculty
Senior Research Associate
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Lecturer
Education Specialist
Head of ECDRC
Senior Education Specialist
Research Fellow-I
Senior Research Associate
Senior M.D. Specialist
Senior Manager
Head of Programs
Field Facilitator
Senior Sector Specialist
Senior Accounts Officer
Librarian
IT Support Officer

Institute of Governance Studies

Barrister Manzoor Hasan
 Dr. Rizwan Khair
 Professor Dr. M. Emdadul Haq
 Mr. Mohammad Sirajul Islam
 Mr. Mohammad Kamrul Hasan Bhuiyan
 Mr. Md. Khorshed Alam
 Ms. Farhana Ahmad
 Mr. Mohammad Jahirul Quayum
 Mr. Jamil Ahmed

Director
Academic Coordinator
Professor
Research Assistant
Manager (Accounts & Finance)
Assistant, DCO, Savar
Senior Project manager
Senior Program Manager
Head of Programs

CENTRE FOR LANGUAGES

Ms. Syeda Sarwat Abed	<i>Director</i>
Mr. Ivan Shafaat Bari	<i>Coordinator</i>
Ms. Shaheen Ara	<i>Lecturer</i>
Ms. Jesmine Zaker	<i>Lecturer</i>
Ms. Mahmuda Yasmin Shaila	<i>Lecturer</i>
Ms. Effat Hyder	<i>Lecturer</i>
Ms. Samina Nasrin Chowdhury	<i>Lecturer</i>
Mr. Sheikh Fazle Shams	<i>Lecturer</i>
Ms. Liza Reshmin	<i>Lecturer</i>
Mr. Md. Golam Jamil	<i>Lecturer</i>
Mr. AQM Khairul Basher	<i>Lecturer</i>
Mr. Sanjoy Banerjee	<i>Lecturer</i>
Ms. Farrah Jabeen	<i>Lecturer</i>
Ms. Moutushi Khandaker	<i>Lecturer</i>
Ms. Tahreen Ahmed	<i>Lecturer</i>
Mr. Mohammad Aminul Islam	<i>Lecturer</i>
Ms. Sadia Nasrin	<i>Lecturer</i>
Ms Nipa Nasrin	<i>Lecturer</i>
Mr. Ahmed Salehin Kaderi	<i>Lecturer</i>
Mr. Md. Rejaul Karim	<i>Lecturer</i>
Ms. Sadra N. Siddiky	<i>Lecturer</i>
Mr. S. M. Anwaruddin	<i>Lecturer</i>
Ms. Sunida Witayakarn	<i>Lecturer</i>
Mr. Khurum Malik	<i>Lecturer</i>
Ms. Tahmina Anwar	<i>Junior Lecturer</i>
Ms. Bidisha Zaman	<i>Junior Lecturer</i>
Ms. Samia Zerín	<i>Junior Lecturer</i>
Mr. Kazi Sarmad Karim	<i>Junior Lecturer</i>
Ms. Suma Saha	<i>Teacher</i>
Mr. Abdullah Arif Muhammad	<i>Teacher</i>
Ms. Tamanna Maqsood	<i>Teacher</i>
Ms. Farzana Ahmed	<i>Part Time Language Faculty</i>
Ms. Elena Bass	<i>Part Time Language Faculty</i>
Mr. Sultan Ahmed	<i>Part Time Language Faculty</i>
Mr. Rafique-Um-Munir Chowdhury	<i>Part Time Language Faculty</i>
Ms. Lisa Ponzetti	<i>English Language Fellow</i>
Ms. Sharlene Nisha Alam	<i>Faculty</i>
Mr. Pankaj Paul	<i>Teaching Assistant</i>
Ms. Rubaiyat Jabeen	<i>Teaching Assistant</i>
Ms. Nurunnesa Sabera	<i>Department Coordination Officer</i>
Ms. Afruza Begum	<i>Assistant Department Coordination Officer</i>

Partners in Education

Over the years BRAC University has partnered with the following reputed academic institutions around the world to enhance our own educational experience by learning from others.

Institute of Governance Studies

- Korea Development Institute School of Public Policy and Management, Seoul, Korea
- Monash University, Australia
- Griffith University, Australia
- University of Manitoba, Canada
- Basel Institute of Governance, Basel University, Switzerland
- George Mason University, USA

Institute of Educational Development

- George Washington University, Washington, DC, USA
- National University of Educational Planning and Administration, New Delhi
- University of Sussex, UK
- Columbia University, New York, USA
- Aga Khan Foundation, Canada
- Open Society Institute - London
- Victoria University, Canada
- Yale University, USA
- Portland State University, USA
- University of Massachusetts, USA

James P Grant School of Public Health

- Bloomberg School of Public Health, Johns Hopkins University, USA
- Mailman School of Public Health, Columbia University, USA
- George Washington University, USA
- Harvard School of Public Health, Harvard University, USA
- Heidelberg University, Germany
- International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)
- Karolin Institute, Sweden
- Kerala Institute, India
- London School of Hygiene and Tropical Medicine, UK
- TATA Institute of Social Sciences (TISS), India
- University of Amsterdam, Netherlands
- University of Aberdeen, UK
- University of Liverpool, UK
- University of Nagasaki, Japan

BRAC Business School

- Asian Institute of Technology, Bangkok
- Asian Institute of Management, Manila
- University of South Australia
- Bloomsburg University of Pennsylvania, USA

Department of Architecture

- University of Illinois, Chicago, USA

Postgraduate Programs in Disaster Management

- Northumbria University, UK
- Katmandu University, Nepal
- Kyoto University, Japan
- Asian Disaster Preparedness Center, Thailand
- Asian University Network of Environment and Disaster Management (AUEDM)

BRAC Development Institute

- University of Manchester
- Institute of Development Studies, Sussex University

Resources, Facilities and Services

Resources at BRAC University

BRAC University has significant faculty and human resources, physical and financial resources. BRAC University has managed to create an ideal environment for students to acquire knowledge.

Faculty

BRAC University faculty comprises a unique blend of teachers, researchers and practitioners. The faculty consists of a distinguished body of scholars with proven teaching and research excellence. Many have doctoral degrees from universities abroad. Many are postgraduate degree holders and professionals with varied experience. Visiting faculty members from USA, Canada, UK, Australia and other countries bring diversity and richness in the learning environment.

Campus

The present campus of BRAC University is located at Mohakhali in Dhaka City. The campus has excellent communication links to all parts of the city as well as outside the city. Different means of transports including taxis, CNG's, rickshaws, and buses are readily available around the campus. Moreover, the campus is situated five minutes away from Mohakhali's primary bus stands.

The main five-storied University Building accommodates a lounge, an information desk, a student counseling office, classrooms, seminar rooms, the Registrar's office, Administrative office, Accounts office, Executive floor, a cafeteria, a student's common room and a semi outdoor sitting plaza (Prangan). BRAC University (BRACU) occupies eighteen floors of University Building (former Aarong House), a twenty-storied building situated adjacent to the five-storied University building. The BRACU library extends over two floors of this structure. BRAC Business School (BBS), Department of Computer Science and Engineering (CSE), Department of Electrical and Electronic Engineering (EEE), Department of English and Humanities (ENH), Centre for Languages (CfL), Department of Mathematics and Natural Sciences (MNS), BRAC Development Institute (BDI), Systems Office and video conferencing, classrooms, computer labs, Biotech and Physics labs and internet facilities for students are also located there. The University also occupies six floors of Civil Engineers Bhaban (CB), a building located a block away from the main University building. These floors house the Departments of Architecture (ARC), Economics and Social Sciences (ESS), Schools of Law (SoL) and James P Grant School of Public Health (JPGSPH). The Institute of Governance Studies (IGS) is located in Gulshan, while the Institute of Educational Development (IED) is in Niketan, Gulshan.

The University plans to shift its activities to the new campus in four to five years. The process of acquiring land in Badda, Gulshan and constructing the permanent building is under process.

Residential Semester

The Residential Semester (RS) at BRAC University is a unique experience in university education in Bangladesh. All students are required to attend a Residential Semester within the first year of admission, the first semester will be held in Mohakhali Campus and one of the following two semesters will be a Residential Semester in Savar Campus. The two main goals of this short but intensive program are to develop the leadership skills of the students, so that they will be competent, ethical and enlightened leaders relevant to the development of Bangladesh and to improve their communication skills especially, in English. The layout of the semester design is based on a study that was done by a group of educational experts. The compulsory courses for RS include English, Bangladesh Studies and Ethics & Culture. Through various exercise and activities, the students will develop leadership qualities as well as the ability to live and function together as a group.

Facilities for Learning

Classrooms

BRAC University has classrooms of various sizes, ranging from regular ones that can hold 30-50 seats, to large ones with a capacity of 80-100 seats. Each classroom is fully air-conditioned and equipped with multimedia projectors, overhead projectors and computers with access to the Internet. Some classrooms have, in addition to these, televisions, VCR and equipments that can be used for teleconferencing. Furthermore, BRAC University has access to facilities at BRAC Centre Inn and BRAC support facilities all over Bangladesh for the use of teachers and students during field visits.

Computer Labs

Currently there are around ten computer labs at University Building, one at the Civil Engineer's Building, four in the Savar campus, including a SPSS lab that is used exclusively by MPH students, and one in the Institute of Governance Studies (IGS) at Gulshan. These computer labs have a total of 345 computers, of which 80 are in the Savar campus and 26 are in the Rajendrapur campus. These are all latest model personal computers with built-in multi-media connected to IBM Servers by a local area network (LAN). For all lab work, there is one computer for each student. Computers are connected to a host of other peripheral devices such as scanners, printers etc. Suitable UPS/IPS units back up electric power supply to all computers and peripheral devices. All labs have multi-media projectors and portable white boards.

Furthermore, stand-by generators back up other electric equipment. All these facilities are continually being upgraded to keep pace with changing technology. Furthermore, all servers have been upgraded with new configurations, as have the student, staff and faculty main servers.

Digital Lab

The purpose of establishing a separate digital lab was to enhance students' understanding of microprocessors, circuits and electronics. This lab contains a wide variety of equipment, including analog and digital oscillo-scopes, trainer boards, PLD trainer boards, microprocessors, digital multimeters, digital chips, analog ammeters, analog voltmeter, wattmeters, rheostats, function generators, inductors, capacitors and other such equipment.

Electronic Systems Laboratory

This laboratory provides support for instruction and research in the areas of basic analog and digital logic design, discrete component testing, fundamental circuit design, microprocessing interfacing, assembly language programming and communication theory. The laboratory is equipped with digital systems development including FPGA/VHDL for advanced course work and thesis research, CAD facilities capable of schematic capture, circuit simulation and fault detection. The lab utilizes various test equipment to include but not limited to oscilloscopes, signal generators, spectrum analyzer, DSO and logic analyzer, multimeters and high-speed data acquisition equipment.

Telecommunication Laboratory

The telecommunications laboratory, a state-of-the-art facility, is fully equipped with hardware and software to support a multitude of instructional and thesis/ project activities on the broad area of analog communication (e.g., AM and FM) and digital communication, wireless and mobile communications, multimedia communications and network simulation. Lab facilities also include PCM analyzer/ Frame analyzer, PCM performance analyzer and trainer for digital modulation and keying (e.g., Phase Shift Keying (PSK), Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), Quadrature Phase Shift Keying (QPSK) etc).

Signal Processing Laboratory

This laboratory supports instruction and thesis/research in the area of Digital Signal Processing. Research and thesis work include data modeling and processing, image analysis and modeling, signal detection and classification, multi-rate processing and other areas. Lab facilities include several PCs equipped with the latest MIDAS Engineering hardware and standard software package.

Electromagnetics Laboratory

This laboratory supports instruction and project/thesis in the area of microwave systems and technology. This is accomplished with a mix of hardware, instruments and test systems. The Lab facilities include Microwave communications teaching set (scanTEK 2000) with CT60 and CT60IS.

Control Systems Laboratory

This laboratory emphasizes problem based learning and research using pilot plant. Lab facilities include servo control stations (CA06, LJ Group) and associated computers (equipped with A/D and D/A data acquisition cards, Matlab/SIMULINK software and RT-Linux for RTS) that are used to conduct simulations and physical experiments, modeling, analysis, and design of control systems, transducer instrumentation trainer (DigiAC 1750).

Optical Electronics Laboratory

The Optical Electronics Laboratory provides educational and project/thesis support in the areas of fiber optics, integrated optics and electro-optics. The Lab facilities include fiber optics instrumentation (optical fibres DL 3155M63, De Lorenzo Group) set. This laboratory supports ECE340 and ECE410 courses.

Cisco Networking Laboratory

The Cisco Laboratory of BRAC University has the Cisco Premium Bundle 1.6, which includes 2600 routing products, switching products and other support products. Students will learn how to install and configure Cisco switches and routers in multiprotocol networks using local-and wide-area networks (LANs and WANs), provide Level 1 and 2 troubleshooting services, and improve network performance and security. Additionally, instruction and training are provided in the proper care, maintenance, and use of networking software tools and equipment. The laboratory caters to the networking courses into which the CCNA certification Program has been integrated. Along with that this lab is also used for some introductory and intermediate Computer Science and Engineering courses' laboratories.

Linux Laboratory

BRAC University has a dedicated Linux Laboratory using the Fedora Core 6 distribution at the time of this writing. The Linux Laboratory is used for all the advanced Computer Science and Engineering laboratory courses, as well as for some of the introductory and intermediate ones. It is also heavily used for undergraduate thesis projects. The Linux Laboratory is set up so that the software on the client computers can be installed, or upgraded, and managed using a solution that does not require any operator intervention.

Physics Labs

For the undergraduate program in physics, laboratory experiments on different topics of physics have been set up. These labs supplement the theory courses and strengthen students' theoretical concepts. Students of other departments taking physics courses can also carryout experiments using the physics lab facilities in addition to their theory classes.

Mathematics Lab

MNS Department also has a mathematics lab where students solve mathematical problems on calculus, numerical analysis, matrices, ordinary and partial differential equations etc. using the "mathematica" software.

Biotechnology Lab

A unique feature of the Master's in biotechnology course run by the MNS Department is to give emphasis to lab exercises. There are Pharmacy labs in Arong House. There are other labs facilitated by having MOU'S with BRAC ARDC at Gazipur, ICDDR,B and the University of Dhaka. These agreements will make it possible for the students to use these lab facilities whereby they can acquire the very necessary hands-on experience. It is also envisaged to set up the different biotechnology labs at BRAC University gradually.

ENH Writing Lab

A Writing Lab, a student run writing tutorial centre, is instituted at the Department of English and Humanities (ENH) for the students of the department. This centre is aimed to help ENH students identify and overcome various writing difficulties through peer review and individualized tutorial sessions by the students of the department. Each tutor has two designated hours per week for the tutoring task that includes providing support at all stages of the writing process. Students can drop by the Writing Lab during available hours or sign up for a specific slot of time with a specific tutor of their preference.

Video Conferencing Centre - Global Development Learning Network (GDLN)

BRAC University is the one and only affiliate of the Global Development Learning Network (GDLN) (<http://www.gdln.org>) in Bangladesh and has been operating since 2006. This centre is coordinated by the World Bank from Washington D.C. The GDLN is a partnership of over 120 recognized global institutions (affiliates) in over 80 countries that collaborate in the design of customized learning solution for individuals and organizations working in development. Affiliates are as diverse as the Asian Institute of Management, the Ethiopian Civil Service College, the Islamic Development Bank and Pontificia Universidad Catolica of Peru. The centre for GDLN at BRAC University has its own Video Conferencing Centre. This is located at the 18th floor of Aarong House and is used to conduct live meetings, corporate affairs, seminars and presentations among people who are geographically apart. Furthermore, it enables virtual tours and participation in global events. Around 40 people can participate at a time.

IT Network

The IT Network of BRAC University enables all members, students and faculty alike, to maintain personal user accounts with an email account and a home folder. In addition to this, all members can access certain common folders. This makes sharing and distribution of class lectures, assignments and other such information a mouse click away. BRAC University now has 900 workstations linked together through Local Area Network (LAN) and Wide Area Network (WAN).

Architecture Studios

There are eight architecture studios at BRAC University, each equipped with large drawing tables, worktables, equipments such as rulers, lockers and plenty of space in which to display the final outcomes. Each of these studios can hold up to 20 students at a time.

Ayesha Abed Library

The Ayesha Abed Library (<http://library.bracu.ac.bd/>) at BRAC University aims to provide support for the University's learning, teaching and research activities. The library supports the curriculum

and research needs of the University community through the development of pertinent collections and the provision of services designed to facilitate access to information and learning.

The library houses approximately 18,000 books in its collection and access to over 13,000 e-journals. The library has extended the range and depth of its collection through subscribing to the e-resources via PERI under the Bangladesh INASP PERI consortium program. The library also subscribes to a number of databases such as JSTOR, eGranary, AGORA, HINARI, EOLSS, and OARE. The library regularly provides training, orientation, and workshops for a wide variety of groups and individuals.

The Library is planning further changes to improve access to resources and services. In 2008, the Ayesha Abed Library successfully implemented a Digital Institutional Repository Project (<http://dspace.bracu.ac.bd>) funded by INASP (International Network for the Availability of Scientific Publications), UK. The main objective of this project was to support and promote the research and intellectual output of the university. The repository has been established to facilitate both dissemination and preservation of digital material created by the members of the BRAC University. In 2009, with support from the Elsevier Foundation a project has been initiated to create an Integrated Library System (ILS) using open source software KOHA.

To maximize the use of resources it is necessary to help users gain maximum benefit from information sources and systems. At this situation a BRACU Library Learning Resource Centre (LRC) has been established to help users gain maximum support from the library.

BRAC University Cafeteria

The Cafeteria of the university is a spacious and well-lit area that can hold up to 150 students at any given time. It serves a variety of snacks, meals and drinks.

Indoor Games Room

Adjacent to the cafeteria is the Indoor Games Room, with provisions for playing table tennis, carom and chess, etc.

Prangan

Prangan, located on the first floor of the University Building, is an open-air garden with a capacity of 100 students. This area includes a snack bar that serves tea, coffee and snacks, a provision for indoor games such as carom and chess and plenty of seats where students can lounge around and enjoy the fresh air.

Career Services Office (CSO)

The chief mission of the Career Services Office (CSO) at BRAC University is to prepare students for the job market in Bangladesh. CSO will provide a knowledge base in career planning skills and tools. The activities at CSO are partnership-effort oriented; it makes a match between the individual student and the employing organization. CSO provides a variety of programs, workshops, and individual counseling opportunities to help students to develop themselves professionally. The services provided to students are consistent with the institution's mission.

Ways to develop skills

- Internships
- Through BRAC University Clubs, Organizations, etc.

Extracurricular Activities

- Professional Skills Development Program (PSDP)
- Workshops

Services that are offered from the office are

- Career counseling
- CV referrals for jobs
- CV critiquing
- Arranging internships
- Arranging networking sessions

Services that are offer to assist in the job search process

- Job postings
- Job search materials
- Professional Skills Development Program
- Networking opportunities

Teaching Learning Centre (TLC)

The Teaching Learning Centre (TLC) at BRAC University works both with faculty and students to examine attitudes towards teaching and learning. TLC was introduced in the year 2006 with the mission to build awareness among students, encourage and facilitate a student centered learning environment across the departments of the University.

TLC organizes:

- Retreat two-day workshops for teachers
- Two-day orientation workshops for students that introduce as well as implement the concept of self-rules at the Residential Semester
- Study skill workshops for Residential Semester students
- Individual counseling for students with study problems

In addition, TLC offers support in developing student centered learning courses. Recently, it has helped restructure the Ethics and Culture course that is conducted at the Residential Semester of BRAC University. The course now includes self-reflection essays, discovery of self, Ethics Committees and dramas. Evaluation has shown that students now enjoy, participate and learn much more in the course.

Center for Languages (CfL)

Through its hard work and focus on creative and forward thinking teaching concepts, the English Language Programme (EL Pro) has now become BRAC University, The Centre for Languages, (BRACU CfL).

BRACU CfL is offering a new and exciting range of languages, such as English, Chinese, French, Spanish, Japanese, Russian, and of course, Bangla. The Centre's learners include students who need a foreign language for successful admission to a graduate program, and adults who need a foreign language to be successful in the global economy. We hope to assist expatriates living in Dhaka, who need to or would like to learn Bangla.

Centre for Research on Bangla Language Processing (CRBLP)

The Centre for Research on Bangla Language Processing (CRBLP) is the only research centre in Bangladesh that is dedicated to software localization. It was established in 2004 with seed funding from the International Development Research Centre (IDRC) of Canada through its PAN Localization Network (PanL10n) program, and has since secured additional support from the Microsoft Corporation of USA. The CRBLP research team has been working on Bangla Document Authoring, Information Retrieval (Spelling Checker, Search Engine), Optical Character Recognition, Speech Processing (Speech Synthesis, Speech Recognition), Machine Translation, Pronunciation Generator, Morphological Analysis, Parts of Speech Tagging, Computational Syntax, Grammar Checker, Text Categorization, Language Modeling and related research areas. In

February of 2009, CRBLP launched the first open source Bangla optical character recognition and Bangla text to speech software packages. With funding from Microsoft, CRBLP localized Microsoft Vista and Office, which may be downloaded for free from Microsoft's website. All of CRBLP's software is released under an open source license. Further details are available at the CRBLP website <http://crblp.bracu.ac.bd>.

Economics and Social Sciences Research Cell (ESSRC)

The Department of Economics and Social Sciences (ESS) has established a research cell to facilitate research by its faculty and graduate students. The objective of this cell is to create a supporting environment for research by providing services ranging from basic research and data collection, to the broader issues of problem identification and mentoring by senior faculty. The cell organizes regular seminars and workshops as a means to disseminate research results, and to foster collaboration among the researchers within and beyond the university. The ESS research cell is planning to bring out a journal annually to disseminate original research findings, and to create a database of primary and secondary data.

BRACU Journal

Ten issues of BRACU Journal were published so far from BRAC University. The journals contained articles relevant to the departments/schools/institutes/centre of BRAC University. The contributions came from both within and outside BRACU.

Student Affairs

BRAC University's mission is to achieve excellence in all round education. The components of all round education, i.e., learning, development and identity formation are interactive and add to each other. The students can experience all of these through participating in co-curricular activities along with regular studies. University's Student Affairs department (SA) provides full support in this respect.

Clubs and Forum

The co-curricular arena of the university is quite vibrant and student-oriented. The composition of each club or forum includes teacher/staff advisors and student representatives. Enrolment of members is done during the club fair held each semester. The Director of the Student Affairs supervises the activities with the help of an assistant director and a student affairs officer. A multi-use hall, two eighty-seat lecture halls, cafeteria and a planted semi-outdoor space with technical support are used for seminars, workshops, exhibitions, indoor games, competitions, fairs and cultural activities. The residential campus in Savar provides a play field for outdoor games. The facilities of BRAC throughout the country such as training centers with dormitories, transport and guides are available for tours and other events.

A yearly award system has been introduced for the students with major contributions as well as for the most active club. The SA has currently adopted the 'Ambassador Program', where students good in leadership, time management, collaboration and teamwork are selected from clubs and forums and trained to represent the university.

Annual assessment of the co-curricular activities has been conducted since 2006. University rules have been introduced for participating in the activities without hindering academic performance.

The Student Affairs emphasizes on the wholeness of university experience through synchronized development of body, mind and spirit. It aims at integrating co-curricular with academic learning, and stresses on service learning through community volunteer work.

There are a total of 30 student clubs and forums in categories of:

- Arts/Culture
- Social Welfare/Community service
- International
- Entrepreneurial
- Subject related
- Sports
- Science

These clubs and forums provide opportunities for developing leadership, confidence, goal setting, sense of ownership, time management, collaboration and teamwork. The clubs and forums are:

- AIESEC BRACU (International Club)
- Football Club FCBACU
- Art Society BRACU
- Global Affairs Forum GAFBRACU
- Business Club Biz Bee
- Indoor Games Club BUIGC
- BRACU Student Newsletter
- MBA Forum (for MBA Students)
- Computer Club BUCC
- MIS Club
- Cricket Club BRACU Cricket Club
- OIKOS Dhaka (International Club)
- Cultural Club BUCuC
- National Heritage Forum BUNHF
- Debating Club BUDC
- Photography Club BUPC
- Drama and Theater Forum BUDTF
- Natural Sciences Club BUNSC
- ECE Club
- Social Development Forum SDF
- Economics Club BUEC
- Social Entrepreneurship Forum BUSEF
- Entrepreneurship Development Forum EDF
- BRAC University MIS Forum
- Environment Awareness Forum BUEAF
- Rotaract Club of BRAC University
- Film Club BUFC
- Rural Development Club BURDC
- BRACU Perecon
- HoV BRACU

Major activities of clubs and forums include:

- Club Fair
- Film Show
- Cricket, Football and Indoor Games
- Trade Fair
- Voluntary Blood Donation Campaign
- Community Volunteer Work
- Art, Photography and Hobby Exhibition
- Seminar and Workshop
- Competitions in Art, Debate, Music, Photography, Film
- Celebration of national and international events such as Pohela Boishakh, International Mother Language Day, Independence Day, Victory Day.
- Business plan, Photography, Computer programming
- Publishing Newsletter

- Study Tour
- Annual Drama
- Archives
- Annual Cultural Program
- Research
- Concert
- Help group/Help sessions

BRAC University Alumni Association

Objective of this association is to promote the interests of BRAC University Alumni network, guide and mentor students and alumni and ensure that BRAC University stays dynamic and constantly updated in response to the changing needs of society.

Our mission is to connect alumni to BRAC University and, provide each other valuable benefits, services and resources and support to the University's mission of teaching, research and service.

The association provides professional and personal enrichment opportunities for alumni and friends through educational, informational and social events. Working closely with the University, the Association informs alumni of the University's events and news provides a forum for continued dialogue with the University.

The association is intended to provide services such as helping students finding jobs, career advice for freshers, sharing job experiences, building fund-raising support, providing suggestions to change the BRAC University curriculum which will meet the current demands of the market and strengthen BRAC University's outreach.

Any graduate of BRAC University, who has obtained an honorary or regular degree (undergraduate or postgraduate), certificate or diploma from BRAC University, or was formally enrolled at BRAC University as a full-time or part-time student for a period of not less than two semesters or equivalent; as well as all alumni of BRAC University, is considered to be members of the BRAC University Alumni Association. An executive committee consisting of six members carries out the operations of the association. Each executive committee stays in office for one year. To assist the executive committee in their duties, there are several subcommittees, each in charge of different aspects of the organization. Please visit the website of Alumni at <http://alumni.bracu.ac.bd>

Finance and Accounts Department

Finance and Accounts department receives tuition fees, other fees and donations from students and donors respectively and usually make all types of payments, and prepare and provide various reports to the management such as weekly fund position, monthly central budget variance report, quarterly department-wise budget variance report, annual financial statements, provident fund financial statements, fund management, donors report etc. BRAC University is also running more than 42 donor projects and maintain all the activities like students' enrollment and registration, accounting, payroll, fixed assets management system, cheque management systems, provident fund, income tax, etc. through the touch of modern softwares. Finance and Accounts Department also provides information and all types of analysis, various reports, etc to the management for assist in the decision making.

ACADEMIC SYSTEM

Undergraduate Programs

BRAC University follows a model of higher education consisting of semesters, courses, credit hours, continuous evaluation and letter grading.

Academic Standards

In keeping with its mission and goals, the University strives to ensure high academic standards by implementing well-designed curricula, carefully selecting high quality students and faculty, utilizing modern and effective instructional methods and aids, and by continuously monitoring and rigorously evaluating all the pertinent activities and systems. As mentioned earlier, BRAC University has built up resources and facilities to ensure high academic standards.

Semesters

There are three equal semesters-Spring, Summer and Fall. The duration of each semester is 13 working weeks. An additional week for each semester is allocated for final exams. Usually the Spring semester commences in January, the Summer semester in May and the Fall semester commences in September. The Semester Calendar provides deadlines for registration, add/drop courses, withdrawals etc. This has financial and academic implications.

Course Numbering System

Each course is identified by a two-part numbering system. The first part with three alphabets represents the subject area and the second part refers to the level of the course as follows:

1st Year courses: 100-199 3rd Year courses: 300-399
2nd Year courses: 200-299 4th Year courses: 400-499

The series 100, 200, 300 and 400 numbers are intended to indicate progressively more demanding content of the course and correspondingly increasing competence on the part of the students enrolled in the course. For example, ACT 301 Intermediate Accounting is a third year course and it is assumed that a student registering in this course has already attended one or more second year (200 levels) courses in Accounting. A student may register in this course before third year if he has already fulfilled the prerequisites for the course. The course may be taken after third year also when the student has fulfilled the prerequisites. Courses numbered 001-099 are remedial or non-credit courses.

Student Classification and Course Load

Students enrolled in the undergraduate programs of BRAC University are classified as Freshman, Sophomore, Junior, Senior and Advanced Senior based on the number of credit hours earned towards a degree. The basis and classification are as follows:

Level	Earned Credits
Freshman	0 to 30
Sophomore	31 to 60
Junior	61 to 90
Senior	91 to 140
Advanced Senior	140+

A student who registers for 12 credits or more is considered to be a full time student. A full-time student taking 12 credits in each semester will be able to complete the program in less than four years. Fee waivers, scholarships and academic honors are considered for full time students only.

Maximum period to complete the undergraduate program is eight years from the date of first admission to the university and minimum period to complete the undergraduate program is three years.

Credit hours

Students take courses each semester and these courses have credits assigned to them and the credits are counted towards the degree. Credit hours for a course are assigned on the basis of a 13-week semester. One (1) credit hour means that the course meets for 50 minutes in a class each week; Three (3) credits mean that the class will meet twice a week for 80 minutes in each session. The tutorial/lab/ workshop sessions meets for 100 - 150 minutes each week. Two (2) credit courses mean that the course meets twice every week for 50 minutes in each class.

Student Advising

Good advising is critical for successful graduation. For most students, University will be the first time that they will be responsible for things such as selecting courses or choosing a major. An academic advisor, a faculty member, can help with these and other decisions; however, advising is a two-way street. Students and advisors share the responsibility for successful advising.

Performance Evaluation

The performance of the students will be evaluated throughout the semester by class tests, quizzes, assignments, and mid-term exams. End of semester evaluation includes comprehensive final exams, term papers, project reports etc. Numerical scores earned by a students in tests, exams., assignments etc are cumulated and converted to letter grades at the end of the semester.

Grading System

The grades at the university will be indicated in the following manner:

90	-	100	=	A	(4.0)	Excellent
85	-	<90	=	A-	(3.7)	
80	-	<85	=	B+	(3.3)	
75	-	<80	=	B	(3.0)	Good
70	-	<75	=	B-	(2.7)	
65	-	<70	=	C+	(2.3)	
60	-	<65	=	C	(2.0)	Fair
57	-	<60	=	C-	(1.7)	
55	-	<57	=	D+	(1.3)	
52	-	<55	=	D	(1.0)	Poor
50	-	<52	=	D-	(0.7)	
<50			=	F	(0.0)	Failure

Grades without numerical value:

P: Pass
I: Incomplete
W: Withdrawal

Pass/Fail Option: A course may be taken for a pass/fail grade, providing that the instructor approves the option and the student carries 12 credits for regular letter grades in that semester. A maximum of 16 credits may be taken for credit with the pass/fail grading option. No more than four credits may be taken with the pass/fail grading option in any one semester. Departments may not approve the pass/fail grading option for some courses counting towards the major.

Incomplete Grade: An Incomplete (I) grade is assigned only when a student has failed to complete one or more requirements of the course for an unavoidable reason/accidental circumstance and has applied for I grade. The students who are permitted to appear in make up examination(s) will be assigned an 'I' grade for that course and this grade will stay until the student appears in the make-up examination at the first available opportunity; if s/he fails to appear in the make-up examination the 'I' grade will automatically be converted to 'F' grade."

Withdrawal (W): is assigned to a student who withdraws from the course within the deadline for withdrawal with 'W' grade. A student who withdraws after this date will earn the grade based on his performance before his withdrawal. Exception to this rule may be made on medical ground and on terms and condition imposed by the University.

GPA Computation

The Grade Point Average (GPA) is computed in the following manner:

$$\text{GPA} = \frac{\text{Sum of (Grade points} \times \text{Credits)}}{\text{Sum of Credits attempted}}$$

Grades Review Procedure

The Committee on Academic Standard administers the Grading Regulations and reviews course grades submitted by the Departments.

Academic Standing

Students will be expected to maintain standards in their academic work. They should be taking the requisite number of courses and maintain satisfactory grades in these courses. In particular students are expected to maintain a GPA of 2.00 (both semester and cumulative), otherwise the student will be put on probation for the following semester. If the student fails to maintain a CGPA of 2.00 in the following semester, then the university will review the student's record and may recommend further action that may include options such as changing course of study, taking extra courses or in some cases withdrawing from the university. If a student on probation fails to raise CGPA to 2.00 in three consecutive semesters, s/he will be dismissed from the University. Students whose grade point average is below 1.0 in their first semester may be asked to withdraw from the university.

Courses for Audit and Credit

Audit is a registration status allowing students to attend a course without receiving credit. Both undergraduate and postgraduate students enrolled in BRAC University may audit courses. Graduates of BRAC University or other universities acceptable to BRAC University may enroll for "Audit" of courses. The performance of students auditing a course will not be evaluated or graded and they will receive a grade 'AU'.

Students and alumni of BRAC University will have to pay 50% of tuition fees and other fees. All other students will have to pay full tuition and other fees.

Students currently enrolled in universities acceptable to BRAC University may enroll as a credit student in at best 10 courses (30 credits) on payment of full tuition and other fees of the university. Candidates seeking admission in one or more audit/credit course(s) must apply in prescribed form and the applications will be considered as individual cases. The university reserves the right to accept or reject the applications.

Credit Transfer

Credit transfer from an educational institution with a system similar to BRAC University may be considered after admission. Such candidates will have to apply with required documents and are subject to credit transfer rules of BRAC University.

The total credits transferred by a student from other universities should not exceed 50 credits except for students of Architecture Department for whom the limit is 65 credits. The student must meet the residency requirement of at least two years at BRAC University.

Remedial Courses

Many students joining the university would be coming from Bangla medium schools and therefore would have to adjust to English as the medium of instruction. They may be asked to attend Remedial English courses during or proceeding the semester in which they take regular courses. Students from non-science background or who are weak in Mathematics may be asked to attend a remedial course in Mathematics. The University may ask the students to attend other remedial courses if necessary.

Requirements for the Degree

As BRAC University is based on the US University system, all undergraduate degrees are for about four years duration. For each degree at least 120 credits are required. Students are responsible for meeting degree requirements. Before selecting the courses in each semester students should consult their academic advisor. The university reserves the right to bring in change into programs and curricula without notice whenever circumstances warrant such changes.

Following are the requirements for graduation in an undergraduate program:

- ❑ A minimum of 120 credits for a bachelor's degree out of which at least 70 must be earned at BRAC University. For students of Architecture Department at least 134 credits must be earned at BRAC University.
- ❑ Attending Residential semester is compulsory for all BRACU students. Completion of all course requirements for the degree including General education courses, non-major area courses, major area courses, elective courses, courses for double major or minor.
- ❑ A student must complete the requisite number of credits of course work and meet other requirements depending on the program in which he/she is enrolled and must maintain a minimum CGPA of 2.00.
- ❑ A student must have clearance from BRAC University Accounts, Library and Registrar's Office.

Fulfillment of the above conditions does not necessarily mean that a degree will be conferred on the student. The University reserves the right to refuse the awarding of degree on disciplinary or similar grounds.

ADMISSIONS

UNDERGRADUATE PROGRAMS

Minimum Qualification for Applying

- a) Minimum GPA of 2.50 in SSC and HSC separately and a total GPA 6.0.
- b) Alternatively O-Level in five subjects and A-Level in two subjects with a GPA of 2.5 at each level according to BRAC University scale: A=5, B=4, C=3, D=2 & E=1. Only one E is acceptable.
- c) GED is not acceptable

Candidates who have completed higher secondary education (12 years of schooling) under a system different from SSC/HSC or O/A levels will be considered for equivalence by the university on a case to case basis.

Candidates for BS in Computer Science must have Mathematics at HSC or 'A'-Level.

Candidates for BS in Electronics and Communication Engineering, Computer Science and Engineering, and in Physics must have Physics and Mathematics at HSC or 'A'-level.

Candidates for BS in Electrical and Electronic Engineering must have Physics and Mathematics at HSC or A-Level. If a student did not have Chemistry at HSC or A-level, he/she must take a remedial course on Chemistry in addition to the courses required for the program.

Candidates with break of study of more than two years will have to apply separately stating the cause of break of study.

Admission Test

All candidates will have to sit for a written admission test and an interview in the manner as described:

Candidates for BA in English and LLB (Hons):
Written admission test in English and Logical Reasoning.

Candidates for BBA, BS in Computer Science, BS in Computer Science and Engineering, BS in Electronics and Communication Engineering, BS in Electrical and Electronic Engineering, BS in Physics, BSS in Economics:
Written Admission test in English, Logical reasoning, and Mathematics.

Candidates for Bachelor of Architecture (B.Arch):
Written admission test in English, Logical Reasoning, Mathematics and a test in Drawing.

In order to qualify, candidates must pass each section and subsection separately with minimum 40% marks.

Those who qualify in the written test will be called for interview for final selection.

Application for Admission

Application Form, Admission Instructions, Prospectus of BRAC University and other related information are available at the Admission Desk on the Ground floor of BRAC University.

Completed Application with a test fee of Tk. 600 must be submitted to the Admission Desk.

A complete application includes:

- 1) Completed Application Form
- 2) Two passport size color photographs, duly attested
- 3) Attested copies of Certificates and Mark Sheets of all Examinations (SSC, HSC etc.)
- 4) Testimonial/Letter of Recommendation from Institution last attended
- 5) Admission Test Fee Receipt

Provisional Admission

Many students willing to join the university might not have the required standard of proficiency in English language. If the students fail to attain the minimum standard of English proficiency required by the University they may be asked to attend Remedial English courses before the admission to the University. In the end of this course they will have to take an English Proficiency test and if qualified might be admitted to BRAC University.

Conditional Admission

Candidates who have appeared for all the HSC/A Level examinations at the time of making the application may be conditionally allowed to appear for the admission test. If the results of their HSC/A level examinations are published and are satisfactory before the classes start the candidates should submit the records to the registrar's office. If the results are not published before the classes start, the complete results have to be submitted before the end of the first semester of classes. If the results are not satisfactory the admission will be cancelled and the admission fee will not be refunded. Admission test results are valid for one year from the date of publication of the final results of the admission test. If within this period the candidate are able to submit improved results, which meet the University's admission criteria they may be readmitted without payment of admission fees.

Fee Structure

Non-refundable Fees

Admission Fee	Tk. 12,000.00	(one time)
Computer Lab Fee	Tk. 1,500.00	per semester
Student Activity Fee	Tk. 600.00	per semester
Library Fee	Tk. 750.00	per semester

Tuition Fee per Credit*

BBA	Tk. 4,500.00
BS in Computer Science	Tk. 4,500.00
BS in Computer Science and Engineering	Tk. 4,500.00
BS in Electronics and Communication Engineering	Tk. 4,500.00
BS in Electrical and Electronic Engineering	Tk. 4,500.00
BS in Applied Physics and Electronics	Tk. 4,500.00
BS in Physics	Tk. 4,500.00
BS in Mathematics	Tk. 4,500.00
BSS in Economics	Tk. 4,500.00
BA in English	Tk. 4,500.00
LL.B (Hons)	Tk. 4,500.00
B.Arch - Studio Courses	Tk. 5,500.00
B.Arch - Lecture Courses	Tk. 4,500.00

*Subject to enhancement with a notice before a semester

Financial Aid

- Up to 100% tuition waiver to those who obtained GPA of 5.0 (without 4th subject) in SSC and HSC from Science, Arts & Commerce groups or have 7 'A's in 'O' Level (in one sitting) & 3 'A's in 'A' Level and on the basis of performance in the admission test.
- BRAC-FORD Foundation offers full tuition waiver, living & book allowance for meritorious students from disadvantaged financial backgrounds who obtained (without 4th subject) a GPA of 4.5 from Science, and GPA 4.0 from Arts & Commerce in HSC Examination.
- Tuition waiver based on financial needs.
- Tuition waiver based on performance.
- Parents with two children at BRAC University are offered 50% tuition waiver for the second child.
- Physically challenged students will receive special fee waiver at various rates to be determined by the Scholarship Committee on case-by-case basis.

Refund Policy

- ↺ Only tuition fees will be refunded to a student who withdraws from a semester after registration as per the following rates:
- ↺ 100% within seven days from the day classes begin
- ↺ 75% within 16 days from the day classes begin
- ↺ 50% within 23 days from the day classes begin
- ↺ No refund after 23 days
- ↺ Admission and other fees will not be refundable.

Academic Programs

Department of Architecture

BACHELOR OF ARCHITECTURE (B.ARCH) PROGRAM

Introduction

BRAC is concerned with and involved in development issues throughout Bangladesh for the last 37 years. Its commitment to national development through the creation of a workforce suitable for both home and abroad is one of the reasons for the formation of BRAC University. BRAC University is committed to provide education of the highest standards that is responsive to the society's needs. This context provides an excellent opportunity to establish a department of Architecture, which addresses issues of the built environment relevant to the development of the country in relation to global issues in architecture, through creative application of knowledge. The department was established in 2002.

Mission Statement

Recognising BRAC's background, the University's commitments and goal, a mission statement for the department of Architecture can be defined as:

An education to prepare tomorrow's architects for the challenges of a technologically developing world and the challenges that face our nation. To seek solutions that respect the social, cultural and aesthetic needs of the people they serve and work towards the development of an ecologically balanced and sustainable built environment. To learn and to creatively apply modern skills to a modernizing society.

Curriculum Structure

The total credit requirement for the degree of Bachelor of Architecture is 199 credits. A regular student should take about 15 credits per semester. Depending on the student's academic standing and the advisor's recommendation a student may take a maximum of 21 credits per semester. Considering a reasonable and even distribution of credits the length of study for the degree is recommended to be 5 years (15 semesters).

The following are the core areas in which courses are offered:

Design and Communications

Lecture Courses in the following streams

- Architecture/ Planning
- History of Architecture
- Building Science/ Services
- Environmental Sciences
- Humanities & Social Sciences
- Structures

These are supported by elective courses offered at various stages.

A. Architectural subjects

The main components of the architectural education are the design studios; related studio subjects are working drawings, landscape and interior design. To support them are the studio courses in communications that include courses in graphic and digital media. In the final semesters, Seminar courses are offered to complement design studio work. The design studios carry a substantial amount of credit hours so that the emphasis remains in design.

The course wise distribution of credits in architectural subjects are as follows:

Areas	No. of Courses	Credit Hours
STUDIO COURSES		
Design Studios	10	81
Studios related to Design	4	6.5
Communications Studios		
Graphic	3	6
Digital	3	4.5
Written	2	3
Total in Studio Courses	22	101
LECTURE COURSES		
History of Art and Architecture	7	14
Planning and Urban Design	3	6
Building Sciences/Services	5	10
Environmental Sciences	3	6
Electives	5	10
Others	1	2
Total in Lecture Courses	24	48
Total in Architectural subjects	46 courses	149 credits

B. Non-Architectural subjects

The course wise distribution of credits in non- architectural subjects are as follows:

Areas	No. of Courses	Credit Hours
HUMANITIES		
English	2/3	3.5
Sociology/social history	2	4
Psychology	1	2
Philosophy	1	2
Economics	1	2
Planning/Urbanism	2	4
SCIENCES		
Basic Computing	1	1.5
Physics	1	2
Mathematics	1	2
Environmental Sciences	1	2
CIVIL ENGINEERING	7	14
ELECTRICAL ENGINEERING	1	2
MECHANICAL ENGINEERING	1	2
ACCOUNTING	1	2
MANAGEMENT	1	2
Total in Non- Architectural subjects	24 courses	47 credits

C. Practical Training

3 credits

Credits in Studio Courses

Unlike the taught courses the credit earned in the studio courses of the B. Arch. program do not correspond to the contact hours/week. In the design studio courses the credits earned for the ARC101 (Design I) is 4.5 and the corresponding contact hours/week is 9. In the design studio courses that follow, this gap is narrowed and in the final design studio ARC502 (Design X) the contact hours are 15 and the corresponding credits earned is 12. In other studio courses related to design such as ARC311 (Working Drawings I), ARC413 (Estimation) etc the credits earned are almost always half of the contact hours/week (1.5 credits for 3 hours/week). The studio courses require one-to-one contact between the teacher and the student and usually there is more than one teacher per studio. It is only on occasions (project briefing, reviews etc) that the teacher addresses the whole class (unlike the case in lecture courses).

Electives

A student is required to complete 10 credits in elective courses. From the second semester onwards, students may choose from a list of 13 elective courses on offer.

Practical Training

As a requirement for the degree of B. Arch a student is required to complete a semester of practical training in an Architectural office and go through work in the office as well as at the site of a construction project undertaken by that office. A student will have to complete 110 credits before being able to undertake practical training. Students will have to maintain a daily log of their activities signed by the supervisor and a complete portfolio of the work done. Grade will be assigned on the basis of the supervisor's confidential report and an interview by board consisting of teachers of the department.

List of Courses

A. Architectural Courses

STUDIO COURSES

Design Studio Courses

ARC 101 Design I
ARC 102 Design II
ARC 201 Design III
ARC 202 Design IV
ARC 301 Design V
ARC 302 Design VI
ARC 401 Design VII
ARC 402 Design VIII
ARC 501 Design IX
ARC 502/
ARC 503 Design X

Studios Related to Design

ARC 311 Working Drawings I
ARC 312 Working Drawings II
ARC 411 Interior Design
ARC 412 Landscape Design

Communications Studios

Graphic

- ARC 111 Graphic Communications I
- ARC 112 Graphic Communications II
- ARC 413 Estimation

Digital

- ARC 113 Computer Aided Design
- ARC 214 Computer Graphics
- ARC 315 Digital Visualization

Written

- ARC 511 Seminar I
- ARC 512 Seminar II

LECTURE COURSES

History of Art and Architecture

- ARC 121 Introduction to Architecture
- ARC 122 History of Art and Architecture I
- ARC 123 History of Art and Architecture II
- ARC 224 History of Art and Architecture III
- ARC 225 History of Art and Architecture IV
- ARC 326 History of Art and Architecture V
- ARC 327 History of Bengal Art and Architecture

Planning/Urban Design

- ARC 331 Urban Design
- ARC 431 Rural Architecture
- ARC 432 Housing and Development

Building Sciences/Services

- ARC 241 Construction I
- ARC 242 Construction II
- ARC 343 Technology and Construction
- ARC 441 Specifications
- ARC 541 Professional Practice

Environmental Sciences

- ARC 251 Design with Climate
- ARC 252 Lighting and Acoustic Design
- ARC 452 Design for the Environment

Others

- ARC 522 Research Methods

B. Non- Architectural Courses

HUMANITIES

English

ENG 101 English Fundamentals
ENG 203 Communications Skills

Sociology/ Social History

ANT 103 Society and Development
SOC 102 Bangladesh History Culture and Society

Psychology

PSY 421 Psychology for Architects

Economics

ECO 104 Introduction to Economics

Planning / Urbanism

ARC 231 Concepts in Planning
ARC 232 Urbanism

SCIENCES

Basic Computing

CSE 103 Introduction to Computing

Physics

PHY 102 Fundamentals of Physics

Mathematics

MAT 104 Mathematics

Environmental Sciences

ENV 101 Introduction to Environmental Sciences

CIVIL ENGINEERING

CEE 211 Structure I
CEE 212 Structure II
CEE 213 Plumbing
CEE 311 Structure III
CEE 312 Structure IV
CEE 411 Structure V
CEE 412 Structure VI

MECHANICAL ENGINEERING

MEE 344 Mechanical Services

ELECTRICAL ENGINEERING

EEE 345 Electrical services

ACCOUNTING

ACT 511 Accounting

MANAGEMENT

MGT 511 Construction Management

C. Practical Training

ARC 300 Practical Training

D. Elective Courses**Studio Courses**

ARC291 Sculpture

ARC292 Painting

ARC293 Music Appreciation

ARC294 Photography

Lecture Courses

ARC391 Rural Housing

ARC392 Tropical Architecture

ARC393 Building for Disasters

ARC394 Contemporary South Asian Architecture

ARC491 Architectural Conservation

ARC492 The City in Development

ARC493 Contemporary Architectural Thought

ARC494 Ecology and Sustainable Development

ARC495 Computers in Architecture

Department of English and Humanities

The curriculum of the Department of English offers students the opportunity to explore a wide variety of English writing from different historical periods and regions. Courses focus on close reading of texts, authors and literary genres. Students are encouraged to explore the relationship of literary works to their historical contexts and to other disciplines. They are also given a fair amount of grounding in critical theory, cultural traditions and the history of ideas. Together with providing historical and critical perspectives from which to read and analyze canonical and non-canonical texts, the courses deepen students' insight into their own experience. Courses also aim to develop students' abilities to express their ideas orally and in writing.

The department seeks to instill in the students a desire to become proficient and intelligent readers and writers. To that end it aims to develop their ability to think critically and creatively, and to express ideas clearly and forcefully.

DESCRIPTION OF UNDERGRADUATE PROGRAM

BACHELOR OF ARTS IN ENGLISH (BA IN ENGLISH)

Introduction

The BA in English is designed to acquaint students to a broad area of English writing. The program is divided into 3 options, and each option seeks to sharpen students' critical and creative abilities. Courses are designed to develop understanding of culture and society, and special emphasis is given to post-colonial and feminist approaches to literature. Students are also required to take a fair number of writing courses, thus honing their writing skills. Teaching skills and techniques are imparted through specially designed courses. Pedagogical methods followed emphasise interaction and communication, so that students graduate with confidence in both oral and written communication abilities.

Structure of the Program

The curriculum puts a special emphasis on writing courses, which are expected to develop students' writing skills. The department seeks to instill in the students a desire to become proficient and intelligent readers and writers. To that end it aims to develop their ability to think critically and creatively, and to express ideas clearly and forcefully.

Students have three options:

- Option A (Literature)
- Option B (Linguistics and Language) and
- Option C (Media and Cultural Studies)

Students must have 60 credits in English to complete the major requirement. Out of these 60 credits, 30 are compulsory for students from all streams.

Students who take Option A must take ENG 213, ENG 214, ENG 215 and ENG 466.

Students who take Option B must take at least 2 courses from the following: ENG327, ENG328, ENG332, ENG335 and 1 course from the following: ENG434, ENG437 or ENG438. ENG439: Teaching Practicum is compulsory for this option.

Students who take Option C must take either ENG331 or ENG333 and at least 2 courses from the following: ENG401, ENG404, ENG405 or ENG465.

The following are the compulsory courses in the Major area:

- ENG 111 Principles of Linguistics
- ENG 113 Introduction to English Poetry
- ENG 114 Introduction to English Drama
- ENG 115 Introduction to English Prose
- ENG 201 Composition 2
- ENG 217 Shakespeare
- ENG 301 Research Methodology
- ENG 334 ELT Methodology
- ENG 466 Dissertation (6 credits)

Structure of the Undergraduate Program in English

The undergraduate English program consists of 6 general education courses (18 credits) 16 Major area courses, 9 courses outside the Major Area, 7 Free Elective Courses (within the courses offered by the English Department) and a Dissertation (6 credits). The structure of the undergraduate English program is as follows:

Areas	No. of Courses	Credit Hours
Basic Requirements		
(General Education)	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area	16	48
(English)		
Courses Outside Major Area	9	27
Free Elective Courses	6	18
Dissertation	2	6
(Equivalent to 2 courses)		
Total	40	120

The course codes, course titles and course descriptions are given in a separate section of this Prospectus. The program consists of compulsory and elective courses. The compulsory courses in the General Education area are: ENG101, ENG102, CSE101, BIO101/PHY101, MAT103 and DEV101. If a student has completed any such compulsory course(s) at the HSC or A level or equivalent program of study, s/he may be exempted from taking such course(s), but will be required to take course(s) recommended by the Student Counsellor and approved by the Chair of the department. Of the remaining credit courses, 16 are Major Area courses (of which 11 will be compulsory, which are listed below), 7 Free Elective courses, and 9 courses to be taken from outside the Major Area. In addition, students will have to write a dissertation in a specialised area to be decided by the department in consultation with the students.

LIST OF COURSES

ENGLISH MAJOR

General Education Courses (18 Credits)

A. Science Courses (3 Credits)

- CSE 101 Introduction to Computer Science

B. Natural Science (3 Credits)

BIO 101 Introduction to Biology / PHY 101: Introduction to Physics

C. Mathematics (3 Credits)

MAT 101 Introduction to Mathematics / MAT 103: Introduction to Mathematics

D. Social Science (3 Credits)

DEV 101 Bangladesh Studies

E. Humanities (6 Credits)

ENG 091 Foundation Course (in English), non-credit

ENG 101 Fundamentals of English

ENG 102 Composition I

Major Area (48 Credits)

Core Courses (24 credits)

ENG 111 Principles of Linguistics

ENG 113 Introduction to English Poetry

ENG 114 Introduction to English Drama

ENG 115 Introduction to English Prose

ENG 201 Composition II

ENG 217 Shakespeare

ENG 301 Research Methodology

ENG 334 ELT Methodology

Compulsory courses (Concentration: Literature), 24 credits:

Students need to take at least eight courses from the elective list of Literature courses.

Compulsory courses (Concentration: Linguistics and Language), 24 credits:

ENG 211 Sociolinguistics

ENG 212 Psycholinguistics

ENG 221 Discourse Analysis

ENG 332 Teaching Techniques

ENG 327 Second Language Acquisition

ENG 434 Material Design

ENG 437 Testing and Evaluation

ENG 439 Teaching Practicum

Compulsory courses (Concentration: Media and Culture), 24 credits:

ENG 331 Cultural Studies/ENG 333: Globalization and Media

ENG 401 Editing

ENG 404 Copywriting

ENG 440 English for the Print Media

ENG 465 Translation Studies

Any three courses either from Literature or Linguistics & Language.

Elective Courses out side the Major (27 Credits)

HUM 103 Ethics and Culture

Students can take these courses from MGB, LAW, CSE, and ECO department and courses from ARCH.

Free Elective Courses (21 Credits)

Literature Courses

- ENG 213 Survey of English Literature I
- ENG 214 Survey of English Literature II
- ENG 215 Survey of English Literature III
- ENG 218 Post Colonial Writing in English
- ENG 319 Modernism
- ENG 343 Classical Literary Theory
- ENG 355 Survey of American Literature II
- ENG 358 Survey of World literature in Translation II
- ENG 366 Major Texts of the Feminist Tradition in the West
- ENG 367 English Writing and British Colonialism
- ENG 414 Twentieth-Century English Literature
- ENG 458 Women of Talents
- ENG 461 Modern British Drama
- ENG 462 Post Colonial Literary Theory
- ENG 464 Post Colonial Literature

Language and Linguistics Courses:

- ENG 211 Sociolinguistics
- ENG 212 Psycholinguistics
- ENG 221 Discourse Analysis
- ENG 327 Second Language Acquisition
- ENG 328 Advanced Grammar
- ENG 332 Teaching Techniques
- ENG 434 Material Design
- ENG 437 Testing and Evaluation
- ENG 438 Syllabus Design
- ENG 439 Teaching Practicum

Media and Culture:

- ENG 331 Cultural Studies
- ENG 333 Globalization and Media
- ENG 401 Editing
- ENG 404 Copywriting
- ENG 440 English for the Print Media
- ENG 465 Translation Studies

Thesis / Internship (6 Credits)

- ENG 466 Dissertation (two semesters long)

Minor in English

Department of English and Humanities (ENH) offers a minor in English.

Total credit hours required for a Minor in English: 27

Each course comprises three (3) credit hours, and the students will be required to take a total of nine (9) courses.

Compulsory courses (6 credits)

- ENG 217 Shakespeare
- ENG 301 Research Methodology

Two courses from the following: (6 credits)

- ENG 111 Principles of Linguistics
- ENG 113 Introduction to English Poetry
- ENG 114 Introduction to English Drama
- ENG 115 Introduction to English Prose

Two courses from the following: (6 credits)

- ENG 211 Sociolinguistics / ENG 212: Psycholinguistics
- ENG 213/ENG 214/ENG 215: Survey of English Literature I/II/III
- ENG 218 Post-Colonial Writing in English

Two courses from the following: (6 credits)

- ENG 319 Modernism
- ENG 331 Cultural Studies
- ENG 327 SLA/ENG 334: ELT Methodology (Pre-requisite ENG 111)
- ENG 355 Survey of American Literature 2
- ENG 366 Major Texts of the Feminist Tradition in the West

One course from the following: (3 credits)

- ENG 434 Material Design
- ENG 462 Post-Colonial Theory/ENG 464: Post-Colonial Literature
- ENG 404 Copywriting/ENG 440: English for the Print Media

Department of Economics and Social Sciences (ESS)

BRAC University's Department of Economics and Social Sciences (ESS) aims to provide its students with a fully rounded and comprehensive, yet demanding and innovative, Bachelor of Social Science (BSS) in Economics. The department strives to meet the needs of students in all aspects, from introducing them to the basic concepts and issues in economic theory and discourse, to offering them challenging upper level courses that sharpen and focus their understanding and engagement with the discipline. ESS attempts to focus students' thinking in their chosen field, as well as to teach them to apply the concepts learnt in the classroom to real life.

In addition to a Major in Economics, the department also offers a Minor in Economics and a Minor in Sociology. The Minor in Economics will enable students of other disciplines to gain a strong foundation in theoretical and applied micro and macroeconomics along with a basic understanding of the techniques of economic data analysis. The Minor in Sociology, on the other hand, will help students integrate the theoretical knowledge gained in other undergraduate majors such as Economics, English, Business Administration etc with a deeper understanding of the greater social context as well as impart analytical skills and theoretical knowledge of Sociology.

The Department offers the following undergraduate degree program:

Bachelor of Social Science (BSS) in Economics (BSS Econ)

DESCRIPTION OF PROGRAM

BACHELOR OF SOCIAL SCIENCE IN ECONOMICS (BSS ECON)

BRAC University's Department of Economics and Social Sciences (ESS) offers its students a broad, comprehensive, demanding and innovative Bachelor of Social Science (BSS) degree in Economics. The BSS program in Economics is designed to:

- Provide a firm grounding in modern economic theory
- Develop independent thought about economic policies and problems
- Develop a capacity for quantitative research
- Provide a descriptive knowledge about the world economy

The core courses of the Economics major will create a strong theoretical base for any further study in economics. The elective courses can be chosen from a broad range of higher level theoretical and applied courses. This gives the students an opportunity to gain an understanding of various areas in economics. Depending upon their interests, students may choose theoretical courses, which enables the scope of graduate studies in respective areas, or applied courses in different areas for a career in those fields.

Structure of the Program

The undergraduate Economics curriculum consists of general education courses, non-major area courses, major area courses and elective courses. A student may also be required to take non-credit, remedial courses in English and Mathematics to make up his/her deficiencies. The areas, number of courses and credit hours required for graduation are given below:

Areas	No. of Courses	Credit Hours
General Education	7	21
I. Science	3	9
II. English and Humanities	3	9
III. Social Sciences	1	3
Non-Major	8	24
I. Social Science Non-Major Courses		
II. Other Non-Major Area Courses		
Economics Major	16	48
I. Economics Core Courses		
Electives	9	27
I. Economics Electives		
II. Other Electives		
Total	40	120

General Education (21 Credits)

The students must complete 21 credit hours in general education which comprises of courses in English Language, General Science and Social Science. To fulfill the requirement of general education, the students need to complete two courses in English fundamentals and English composition, one course in Ethics and Culture, one course in Mathematics, and one course in basic computer applications. In addition, students must take Bangladesh Studies, which is a course on the social, cultural, historical and economic dimensions of Bangladesh and choose one natural science course from physics, chemistry or biology. A detailed list of general education courses is provided below:

I. Science, compulsory courses: (9 credits)

MAT 101 Fundamentals of Mathematics
or MAT 105 Calculus
or MAT 110 Mathematics I: Differential Calculus and Co-ordinate Geometry
CSE 101 Introduction to Computer Science

And one course from the following:

PHY 101 Introduction to Physics
CHE 101 Introduction to Chemistry
BIO 101 Introduction to Biology

II. English and Humanities, compulsory courses: (9 credits)

ENG 101 Fundamentals of English
ENG 102 Composition I
HUM 103 Ethics and Culture

III. Social Science, compulsory course: (3 credits)

DEV 101 Bangladesh Studies

Non-Major Area (24 Credits)

In addition to the general education course requirements, students must complete 24 credit hours outside the major area of study. For the BSS Economics Program, students are advised to take other introductory Social Science courses like Sociology, Political Science and Anthropology. These courses establish a broad foundation in the Social Sciences and provide Economics students with a wider perspective of their discipline.

SOC 101 Introduction to Sociology
POL 101 Introduction to Political Science
ANT 101 Introduction to Anthropology

Also, those students who intend to pursue higher studies in economics may choose to take mathematics and statistics courses offered by other departments as they prepare the students for a more in-depth understanding of higher level economics courses.

STA 101 Introduction to Statistics
MAT 110 Mathematics I: Differential Calculus and Co-ordinate Geometry
MAT 120 Mathematics II: Integral Calculus and Differential Equations
MAT 203 Matrices, Linear Algebra and Differential Equations

Students planning to pursue corporate careers may choose to take related business courses for a better understanding of the business world.

BUS 101 Introduction to Business
ACT 201 Financial Accounting

Students may also choose other Non-major area courses from various departments in consultation with their advisor.

Economics Major (48 Credits)

In addition to completing the general education requirements of the BSS program, students majoring in Economics must complete 48 credit hours of Core Economics courses. On the one hand, these courses include core components of economic theory, such as microeconomics, macroeconomics, mathematical economics and econometrics. On the other hand, these Economics major courses also include specific applications of economics, such as, international trade, environment, monetary economics, etc. The list of core courses is provided below:

ECO 101 Principles of Microeconomics
ECO 102 Principles of Macroeconomics
ECO 201 Mathematics for Business and Economics
ECO 202 Statistical Methods for Business and Economics
ECO 203 Intermediate Microeconomics
ECO 204 Intermediate Macroeconomics
ECO 303 Introduction to Econometrics
ECO 308 International Trade
ECO 309 Public Finance
ECO 310 History of Economic Thought
ECO 311 Economic Growth and Development
ECO 312 Cost Benefit Analysis
ECO 313 Environmental and Resource Economics
ECO 324 Bangladesh Economy
ECO 431 International Finance and Economic Policy
ECO 432 Money and Banking

Elective Courses (27 Credits)

The remaining 27 credit hours are elective courses, which can be selected from any department. However, a student is advised to take some elective courses in Economics and some from outside the department. In consultation with their academic advisor, a student may choose to take up a minor area of study like Business, Mathematics, English or Computer Science etc. along with the major in economics. They may also choose to take more elective courses from economics for a broader or more rigorous understanding of the discipline.

The elective courses in Economics are designed to enrich the background of the student in economic institutions and the analysis of policy problems. The requirement for Economics Electives can be satisfied from the wide range of advanced theoretical and applied courses offered by the department, which includes public economics, industrial organization, labor economics, monetary economics, agricultural economics, economic growth and development, international economics, health economics, environmental and resource economics and other courses. The following courses are offered as elective courses in economics from the department:

- ECO 205 Mathematics for Economics-II
- ECO 301 Microeconomic Analysis
- ECO 302 Macroeconomic Analysis
- ECO 304 Agricultural Economics
- ECO 305 Labour Economics
- ECO 306 Urban Economics
- ECO 322 Gender and Development
- ECO 323 Health Economics
- ECO 325 Political Economic Analysis
- ECO 331 Corporate Economics and Finance
- ECO 401 Research Methods in Economics and Social Sciences
- ECO 421 Welfare Economics and Development
- ECO 422 Human Capital and Development
- ECO 430 Econometric Analysis
- ECO 491 Introduction to Game Theory
- ECO 492 Advanced Mathematical Economics
- ECO 493 Industrial Organization and Public policy
- ECO 494 Open Economy Macroeconomics
- ECO 497 Seminar on Special Topics
- ECO 498 Independent Study
- ECO 499 Undergraduate Thesis (6 Credits)

The elective courses in economics are offered on the basis of availability of instructors as well as the required minimum number of students.

Minor in Economics

In addition to a Major in Economics, the department also offers a Minor in Economics. Combining the Minor in Economics, with a Major in Business or English gives the students an added advantage in pursuing corporate, public and development sector careers. The requirements for completing a minor in economics are provided below.

Structure of the Program

Students of other departments can attain a Minor in Economics by fulfilling the following requirements.

In order to take the required courses for the Minor in Economics, the students must also complete the necessary prerequisite courses. These are given below:

- ECO 101 Principles of Microeconomics
- ECO 102 Principles of Macroeconomics
- STA 101 Introduction to Statistics

Requirements	Credits
Required Courses: 4 core courses	12 Credits
Intermediate Microeconomics	
Intermediate Macroeconomics	
Mathematics for Business and Economics	
Statistical Methods for Business and Economics	
Electives:	9 Credits
3 electives from economics	
Total Courses:	21 Credits
7 Courses in Economics	

List of Courses for a Minor in Economics

I. Compulsory Economics (12 credits)

- ECO 201 Mathematical Methods for Business and Economics
- ECO 202 Statistical Methods for Business and Economics
- ECO 203 Intermediate Microeconomics
- ECO 204 Intermediate Macroeconomics

II. Economics Electives (9 Credits)

Students must choose three approved 300 or 400 level courses in Economics. These elective should be chosen from below in consultation with an academic advisor from the department of Economics and Social Sciences.

- ECO 303 Introduction to Econometrics
- ECO 304 Agricultural Economics
- ECO 305 Labour Economics
- ECO 306 Urban Economics
- ECO 308 International Trade
- ECO 309 Public Finance
- ECO 310 History of Economic Thought
- ECO 311 Economic Growth and Development
- ECO 312 Cost Benefit Analysis
- ECO 313 Environmental and Resource Economics
- ECO 322 Gender and Development
- ECO 323 Health Economics
- ECO 324 Bangladesh Economy
- ECO 401 Research Methods in Economics and Social Sciences
- ECO 421 Welfare Economics and Development
- ECO 422 Human Capital and Development
- ECO 431 International Finance and Economic Policy
- ECO 432 Money and Banking
- ECO 491 Introduction to Game Theory
- ECO 493 Industrial Organization and Public policy
- ECO 494 Open Economy Macroeconomics

Minor in Sociology

The Department of Economics and Social Sciences (ESS) offers a Minor in Sociology. A Minor in Sociology will help students integrate the theoretical knowledge gained in their undergraduate majors such as Economics, English, Business Administration etc with a deeper understanding of the greater social context as well as impart analytical skills and theoretical knowledge. A sociology

minor aims to provide students with core courses that offer a thorough grounding in the theoretical, analytical and methodological aspects of the discipline, along with a wide range of elective courses that will allow the student to explore different areas of sociology according to their specific interests.

Students who are undertaking a major in Economics, Business Administration and English will all be able to integrate the Sociology minor into their degree requirements. With planning and consultation, students from other degrees could also be eligible for the minor.

Structure of Sociology Minor

Requirements	Credits
Required Courses	
Core Sociological Theories	9 Credits
Additional Courses	
4 Approved additional courses in Sociology (With at least 3 from 300-Level)	
1 Approved 400-Level Course	15 Credits
Total Courses	
8 Courses	24 Credits

List of Courses for Sociology Minor

Total credit hours required for a Minor in Sociology is 24 credit hours. Since each of the courses are of 3 credit hours, students will be required to take 8 courses.

The following courses are compulsory for all intending students:

SOC 101 Introduction to Sociology
 SOC 201 Stratification, Inequality & Power
 SOC 301 Sociological Theory

Students must take at least 4 courses with at least 3 from 300-level courses from the following alternatives:

ANT 101 Introduction to Anthropology
 SOC 325 Theories and Problems of Nationalism
 SOC 310 Population and Society
 SOC 320 Political Sociology
 SOC 330 Sociology of Development
 SOC 335 Urban Sociology
 SOC 350 Women and Society
 SOC 370 Sociology of Marriage and the Family
 SOC 390 Sociology of Deviance
 ECO 322 Gender and Development

Students must take at least one course from the following 400-level courses:

ECO 401 Research Methods in Economics and Social Sciences
 SOC 410 The Individual, Society and Social Control
 SOC 420 Sociology of Religion

Department of Mathematics and Natural Sciences

I. INTRODUCTION

Science plays a pivotal role in the development and progress of modern technology, be it in the realms of physical sciences, biosciences, medicine, social sciences, engineering, agriculture, business, commerce or management.

The Department of Mathematics and Natural Sciences (MNS) at BRAC University envisages providing quality education in basic and applied sciences and mathematics. The Department offers courses in physical and biosciences, mathematics, statistics, economic geography and environmental sciences. It started the undergraduate program for the degree of Bachelor of Science in Physics from the Fall 2005 Semester. The Department also offers undergraduate programs in Applied Physics & Electronics and Mathematics. It plans to start undergraduate programs in Pharmacy, Biotechnology, Microbiology and Biochemistry in the near future.

At present the following undergraduate degree programs are offered at the MNS Department.

BS in Physics
BS in Applied Physics and Electronics
BS in Mathematics

II. DESCRIPTION OF PROGRAMS

1. BACHELOR OF SCIENCE (BS) IN PHYSICS

Physics essentially deals with observations and measurements. "Our job in physics is to see things simply, to understand great many complicated phenomena in terms of a few simple principles and thoughtful analysis of actual experiments", Albert Einstein noted. Understanding of physics equips a person to appreciate the intricate forces of nature and all the exciting and interesting yet some time quite complex phenomena occurring around him. Physics is not only hard facts but if taught and presented in an attractive way it is possible to unfold before the inquisitive mind the myriad of mysteries of nature in an exquisite way. Understanding physics has been a continuous process starting from the olden days when physics was synonymous with natural philosophy (even now in some places Department of Natural Philosophy actually means Department of Physics) till today.

Mission and Goal

We see around ourselves the applications of physics principles in every aspect of a person's life. Physics is cutting across the edge of all aspects of engineering, information technology, biology, medicine, economics and even sociology. Physics by its very nature trains a mind to be analytical and questioning-an essential trait which makes a physicist capable of facing any challenge however daunting that may be. With this in mind an undergraduate program in physics started in BRACU from Fall 2005. This bold step, it is expected, will make a significant contribution towards the development of science & technology in Bangladesh in general narrowing down the technological & economic gap between the developed countries and Bangladesh.

Structure of the Program

A physics undergraduate program has been designed including topics of current interest and applications. Once a student undergoes this course successfully he will be well equipped to face the challenges of life. The program of study also includes courses for improving communication skills, strengthening mathematical base and acquainting the student with the socio-economic & historical backgrounds of Bangladesh. With this academic background it should not also be a

problem to find a suitable and satisfying job in various universities & R/D organizations in the country. The total credit requirements for the degree of Bachelor of Science in Physics is **132**. Out of these 21 credits are for general education. Twenty one major area compulsory courses account for 63 credits. The students are required to complete 3 courses (4.5 credits) of Physics Lab and write a dissertation/report on a suitable thesis/project topic. The thesis/ project work spread over the last two semesters will have a total of 4.5 credits. The students will be required to complete 12 credits choosing from several elective courses in their major field and 27 credits from outside their major specialization. The students may also be required to take non-credit remedial courses in English.

Areas	No. of Courses	Credit Hours
General Education	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (Core Courses)	21	63
Elective Courses	4	12
Physics Lab	3	4.5
Courses Outside Major Area	9	27
Thesis / Project	1	4.5
Total	45	132

List of Courses for Bachelor of Science in Physics

a. General Education: (21 credits)

PHY 110 Mechanics and Properties Of Matter
 CSE 110 Programming Language I
 DEV 101 Bangladesh Studies
 ENG 091 Foundation Course (non credit)
 ENG 101 English Fundamentals †
 ENG 102 Composition I †
 HUM 103 Ethics and Culture
 MAT 102 Introduction to Mathematics

† Other courses in English may substitute these courses depending on the level of the student's proficiency in English

b. Departmental Core Courses: (63 credits)

PHY 113 Waves, Oscillation & Acoustics
 PHY 114 Thermal Physics & Radiation
 PHY 115 Electricity and Magnetism
 PHY 201 Solid State Physics
 PHY 202 Optics
 PHY 204 Classical Mechanics and Special Theory of Relativity
 PHY 205 Statistical Mechanics
 PHY 301 Classical Electrodynamics
 PHY 302 Fluid Mechanics
 PHY 303 Quantum Mechanics
 PHY 304 Atomic & Molecular Physics
 PHY 305 Nuclear Physics I
 PHY 306 Basic Electronics
 PHY 401 Reactor Physics
 PHY 402 Atmospheric Physics
 PHY 403 Plasma & Astrophysics
 MAT 105 Calculus

MAT 203 Matrices, Linear Algebra & Differential Equations
 MAT 204 Complex Variables & Fourier Analysis
 MAT 205 Introduction to Numerical Methods
 STA 201 Elements of Statistics and Probability

c. Elective Courses (12 credits)

PHY 308 Methods of Experimental Physics & Instrumentation
 PHY 309 Introduction to Materials Science
 PHY 310 Advanced Solid State Physics
 PHY 311 X-Rays
 PHY 312 Nuclear Physics II
 PHY 404 Electronic Devices and Circuits
 PHY 405 Mathematical Physics
 PHY 406 Medical Physics & Instrumentation
 PHY 407 Mathematical Modelling in Physics
 PHY 408 Advanced Quantum Mechanics
 PHY 409 Physics of Radiology
 PHY 410 Laser Physics
 PHY 411 Geophysics
 PHY 412 Dynamical & Tropical Meteorology
 PHY 413 General Theory of Relativity
 PHY 414 Field Theory
 PHY 415 Neutron Scattering
 PHY 416 Radiation Biophysics
 MAT 301 Group Theory
 MAT 303 Tensor Analysis

d. Lab: (4.5 credits)

PHY 116 PHY Lab I
 PHY 203 PHY Lab II
 PHY 307 PHY Lab III

e. Thesis/Project: (4.5 credits)

PHY 400 Thesis

f. Courses Outside Major Specialization: (27 credits)*

ANT 101 Introduction to Anthropology
 ARC 292 Painting**
 ARC 293 Music Appreciation**
 Bi0 101 Introduction to Biology
 CHE 101 Introduction to Chemistry
 CSE 110 Programming Language I
 ECE 310 Introduction to Communication Engineering
 ECO 103 Principles of Economics
 ENV 101 Introduction to Environmental Science
 HUM 101 World Civilization and Culture
 HUM 102 Introduction to Philosophy
 HUM 111 History of Science
 MGT 211 Principles of Management
 PHY 313 Physics for Development
 POL 103 Introduction to Political Science
 POL 245 Women, Power & Politics
 PSY 101 Introduction to Psychology
 SOC 101 Introduction to Sociology
 SOC 401 Gender and Development

* Or any other BRACU course outside major specialization with the permission of the student's advisor and the Chairperson of the relevant department

** 2 credit courses

Double Major in Physics

To satisfy the needs of students studying in various disciplines of BRACU desirous of pursuing a double major degree is also offered by the MNS Department.

Students who want to do a double-major, one of them being physics, will have to complete a total of 66 credits, the break down of which is given in the following:

Core Courses

Theory Courses: (45 credits)

PHY 110 Mechanics and Properties Of Matter
PHY 113 Waves, Oscillation and Acoustics
PHY 114 Thermal Physics and Radiation
PHY 115 Electricity and Magnetism
PHY 201 Solid State Physics
PHY 202 Optics
PHY 204 Classical Mechanics and Special Theory of Relativity
PHY 205 Statistical Mechanics
PHY 301 Classical Electrodynamics
PHY 303 Quantum Mechanics
PHY 304 Atomic and Molecular Physics
MAT 105 Calculus
MAT 203 Matrices, Linear Algebra and Differential Equations
MAT 204 Complex Variables and Fourier Analysis
STA 201 Elements of Statistics and Probability

Lab Courses: (4.5 credits)

PHY 116 PHY Lab I
PHY 203 PHY Lab II
PHY 307 PHY Lab III

Elective Courses: (12 credits)

PHY 302 Fluid Mechanics
PHY 305 Nuclear Physics I
PHY 306 Basic Electronics
PHY 308 Methods of Experimental Physics and Instrumentation
PHY 401 Reactor Physics
PHY 402 Atmospheric Physics
PHY 403 Plasma and Astrophysics
PHY 407 Mathematical Modelling in Physics
PHY 410 Laser Physics
PHY 411 Geophysics
MAT 205 Introduction to Numerical Methods

or any other physics course with the approval of the Chairperson of the MNS Department

Thesis: (4.5 credits)

The thesis work should be in line with one of the majors or on some interactive topic involving the two majors.

Minor in Physics

The MNS Department also offers the program of minor in physics for students doing a major in CS, CSE, ECE or any other relevant discipline. Such major-minor combination will stand the students in good stead in the job market.

The details of the Minor in Physics program are given below.

Total credit requirement: 27 credits

There will be seven compulsory courses, each of three credits, which are as follows:

- PHY 111 Principles of Physics I
- PHY 112 Principles of Physics II
- PHY 204 Classical Mechanics and Special Theory of Relativity
- PHY 205 Statistical Mechanics
- PHY 210 Quantum Physics of Atoms, Solids and Nuclei
- PHY 301 Classical Electrodynamics
- PHY 305 Nuclear Physics I

Students may choose any two courses from the following list of elective courses each of three credits offered by the Department.

- PHY 302 Fluid Mechanics
- PHY 303 Quantum Mechanics
- PHY 304 Atomic and Molecular Physics
- PHY 308 Methods of Experimental Physics and Instrumentation
- PHY 309 Introduction to Materials Science
- PHY 311 X-Rays
- PHY 313 Physics for Development
- PHY 409 Physics of Radiology
- PHY 403 Plasma and Astrophysics

or any other physics course with the permission of the Chairperson of the MNS Department.

2. BACHELOR OF SCIENCE (BS) IN APPLIED PHYSICS AND ELECTRONICS (APE)

A 4-year (8 semesters) applied physics & electronics undergraduate program has been designed including topics of current interest and applications. The program of study includes courses for improving communication skills, strengthening mathematical background and acquainting the student with the socio-economic & historical background of Bangladesh. The total credit requirements for the degree of Bachelor of Science in Applied Physics & Electronics is **130**. Out of these 21 credits are for general education. Nineteen major area compulsory courses account for 57 credits. The students are required to complete 4 courses (6 credits) of Applied Physics and Electronics Labs and write a dissertation/report on a suitable thesis/project topic. The thesis/project work spread over the last two semesters (seventh & eighth) will have a total of 3 credits. The students will also be required to complete 15 credits choosing from several elective courses in their major field and 27 credits from outside their major specialization. The students will undergo an internship programme (1 credit) being attached to R/D institutions, electronics and IT firms etc. They may also be required to take non-credit remedial courses in English (ENG 091) if considered necessary.

Introduction

There is a natural synergy between the multifaceted areas of physics in general and electronics in particular. It is well nigh impossible to imagine any field or area where these two subjects have not had profound impacts leading to so many innovations & applications, be it in physical sciences, bio-sciences, engineering, ICT, economics and finance or social sciences. These ever-increasing applications and technological aspects have changed for ever the life of an individual and the ambience and surroundings amidst which he lives.

Objectives

Provide opportunity for students to progressively acquire a thorough grounding in the basic concepts and skills of the central topics of applied physics and electronics along with the required mathematical tools.

Provide with the knowledge and skills in the state-of- the art so that one can develop as a well-groomed graduate able to solve real-life problems.

Prospects

The range of industries and other institutions employing these graduates is wide and very varied. There is an acute shortage of really skillful and professional people with a solid background of applied physics & electronics. With the advancement of ICT and instrumentation the demand for such personnel can only increase with time. Graduates with aptitude for teaching and research will find ample opportunity in the country's teaching & R/D institutions.

Areas	No. of Courses	Credit Hours
General Education	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (Core Courses)	19	57
Elective Courses	5	15
Applied Physics Lab	4	6
Courses Outside Major Area	9	27
Thesis / Project and Internship	1	4
Total	45	130

List of Courses for Bachelor of Science in Applied Physics & Electronics

The graduation program for Applied Physics & Electronics will contain the courses as appended below indicating course numbers and divisions. However, the courses listed below may change as the need be in future.

a. General Education: (21 credits)

- APE 101 Mechanics, Properties of Matter, Waves & Oscillations
- CSE 110 Programming Language I
- DEV 101 Bangladesh Studies
- ENG 091 Foundation Course (non-credit)
- ENG 101 English Fundamentals †
- ENG 102 Composition I †
- HUM 103 Ethics and Culture
- MAT 102 Introduction to Mathematics

† Other courses in English may substitute these courses depending on the level of the student's proficiency in English

b. Departmental Core Courses: (57 credits)

- APE 102 Thermal Physics, Radiation & Statistical Mechanics
- APE 103 Electrical Circuits I
- APE 201 Solid State Physics & Materials Science
- APE 202 Electrodynamics & Electromagnetic Waves & Fields
- APE 203 Electrical Circuits II

APE 204 Digital Logic Design
 APE 205 Electronic Devices and Circuits I
 APE 302 Electronic Devices and Circuits II
 APE 401 Measurements & Measuring Instruments
 ECE 220 Signals and Systems
 ECE 230 Semiconductor Devices and Materials
 ECE 310 Introduction to Communication Engineering
 ECE 320 Microwave Engineering
 MAT 105 Calculus
 MAT 203 Matrices, Linear Algebra & Differential Equations
 MAT 204 Complex Variables & Fourier Analysis
 PHY 115 Electricity and Magnetism
 PHY 202 Optics
 STA 201 Elements of Statistics and Probability

c. Elective Courses: (15 credits)

APE 402 Plasma Physics with Industrial Applications
 APE 403 Control Engineering
 APE 404 Microprocessors and Assembly Language Programming
 APE 405 Computer Organization and Architecture
 APE 406 Radar Engineering
 APE 407 Renewable Energy Technology
 CSE 350 Digital Electronics and Pulse Techniques
 CSE 421 Computer Networks
 CSE 428 Image Processing
 ECE 328 Digital Signal Processing
 ECE 330 Telecommunication Switching Systems
 ECE 340 Optoelectronic Devices
 ECE 424 Power Electronics
 ECE 430 Satellite Communications
 MAT 205 Introduction to Numerical Methods
 PHY 204 Classical Mechanics and Special Theory of Relativity
 PHY 303 Quantum Mechanics
 PHY 304 Atomic & Molecular Physics
 PHY 305 Nuclear Physics I
 PHY 310 Advanced Solid State Physics
 PHY 311 X-Rays
 PHY 406 Medical Physics & Instrumentation
 PHY 409 Physics of Radiology
 PHY 410 Laser Physics

d. Lab: (6 credits)

APE 104 APE Lab I
 APE 206 APE Lab II
 APE 301 APE Lab III
 APE 303 APE Lab IV

e. Thesis/Project and Internship: (4 credits)

APE 400 Thesis/Project: 3 credits
 Internship: 1 credit

f. Courses Outside Major Specialization: (27 credits)*

ANT 101 Introduction to Anthropology
 ARC 292 Painting**
 ARC 293 Music Appreciation**
 BIO 101 Introduction to Biology
 CHE 101 Introduction to Chemistry
 CSE 110 Programming Language I

CSE 111 Programming Language II
ECO 103 Principles of Economics
ENV 101 Introduction to Environmental Science
HUM 101 World Civilization and Culture
HUM 102 Introduction to Philosophy
HUM 111 History of Science
MGT 211 Principles of Management
PHY 313 Physics for Development
POL 103 Introduction to Political Science
POL 245 Women, Power & Politics
PSY 101 Introduction to Psychology
SOC 101 Introduction to Sociology
SOC 401 Gender and Development

* Or any other BRACU course outside major specialization with the permission of the student's advisor and the Chairperson of the relevant department

** 2 credit courses

3. BACHELOR OF SCIENCE (BS) IN MATHEMATICS

Introduction

Mathematics is one of the oldest intellectual pursuits of mankind. Not only it is a demanding subject, but also it is thoroughly exciting, extremely beautiful and immensely useful. People have always been interested in mathematical ideas, partly for their own sake and partly for their usefulness. In modern society there are very few areas of knowledge and practice in which mathematics does not have a role to play. These, increasingly, include areas, which affect our quality of life, such as health related and environmental issues, as well as the contributions mathematics continues to make in business and commerce, and in science and technology. Mathematics is a sine qua non for modern science and technology, and has various applications in physical and biological sciences, medicine, social sciences, agriculture, business and management. Consequently, as a subject of study, mathematics possesses a great diversity, and it offers a wide range of opportunities to identify areas, which relate to people's own interests, concerns, and aspirations. Mathematics is now being increasingly used in practical fields of physical and engineering problems rather than just playing around with abstract ideas and abstruse concepts and applications. Of course, abstracting, i.e., generalizing a problem is beautiful theoretically though it brings concomitant problems difficult to solve at times. The beauty of basic science can only be appreciated through a better understanding of mathematics.

Mission and Goal

There is a common perception in our society that studying mathematics at the higher level of study is not economically viable. However, having strong mathematical background with some understanding in physical or engineering problems, one can move to a wide range of fields in modern science and technology. Now-a-days science is not seen as comprising some discrete parts. Rather it is now growing with interaction and interfacing of multidisciplinary activities. Unless we go for basic subjects in science like mathematics, physics, biology etc. there will be a huge gap between the developed countries and Bangladesh and stagnation will set in and no new ideas will be forthcoming.

Course Structure of Undergraduate Mathematics Program

Mathematics undergraduate program has been designed including topics of current interest and applications. Once a student undergoes this course successfully he will be well equipped to face the challenges of life. The program of study includes courses for improving communication skills, strengthening basic science and computational mathematics background and acquainting the

student with the socio-economic & historical background of Bangladesh. With this background it should not also be a problem to find a suitable and satisfying job in both public and private sectors, various universities, financial institutions and software & R/D organizations in the country. The total credit requirement for the degree of Bachelor of Science in Mathematics is **127**. Out of these 21 credits are for general education. Nineteen major area compulsory courses account for 57 credits. The students are required to complete 2 courses (4 credits) of Mathematics Lab and write a dissertation on a suitable project/thesis topic. The project/thesis work spread over the last two semesters will have a total of 3 credits. The students will be required to complete 15 credits choosing from several elective courses in their major field and 27 credits from outside their major specialization. The students may also be required to take noncredit remedial courses in English.

Areas	No. of Courses	Credit Hours
General Education	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (Core Courses)	19	57
Elective Courses	5	15
Lab	2	4
Courses Outside Major Area	9	27
Project/Thesis	1	3
Total	43	127

List of Courses for Bachelor of Science in Mathematics

The graduation program for Mathematics will contain the courses as appended below. However, the courses listed below may change as the need arises in future.

a. General Education (21 credits)

- BIO 101 Introduction to Biology
- CSE 110 Programming Language I
- DEV 101 Bangladesh Studies
- ENG 091 Foundation Course (Non-credit)
- ENG 101 English Fundamentals †
- ENG 102 Composition I †
- HUM 103 Ethics and Culture
- PHY 111 Principles of Physics I

† Other courses in English may substitute these courses depending on the level of the student's proficiency in English

b. Departmental Core Courses: (57 credits)

- MAT 111 Principles of Mathematics
- MAT 121 Basic Algebra
- MAT 122 Analytic and Vector Geometry
- MAT 123 Calculus I
- MAT 124 FORTRAN Programming
- MAT 211 Calculus II
- MAT 212 Linear Algebra
- MAT 221 Real Analysis I
- MAT 222 Differential Equations I
- MAT 223 Numerical Analysis I
- MAT 311 Abstract Algebra
- MAT 312 Numerical Analysis II

MAT 314 Complex Analysis
 MAT 321 Real Analysis II
 MAT 322 Differential Equations II
 MAT 323 Vector Mechanics
 MAT 324 Discrete Mathematics
 MAT 325 Mathematical Methods
 STA 201 Elements of Statistics and Probability

c. Elective Courses: (15 credits)

CSE 220 Data Structures
 CSE 221 Algorithms
 MAT 313 Differential Geometry
 MAT 316 Operations Research I
 MAT 326 Hydrodynamics
 MAT 411 Topology
 MAT 415 Finite Element Methods
 MAT 416 Tensor Calculus
 MAT 421 Fluid Mechanics
 MAT 422 Theory of Numbers
 MAT 423 Mathematical Modeling
 MAT 424 Operations Research II
 MAT 425 Advanced Numerical Methods
 PHY 112 Principles of Physics II
 PHY 204 Classical Mechanics and Special Theory of Relativity
 PHY 205 Statistical Mechanics
 PHY 303 Quantum Mechanics
 PHY 413 General Theory of Relativity
 STA 301 Modern Probability Theory & Stochastic Processes

d. Lab: (4 credits)

*MAT 250 Mathematics Lab I
 *MAT 350 Mathematics Lab II

e. Project / Thesis: (3 credits)

MAT 400 Project / Thesis

f. Courses Outside Major Specialization: (27 credits)**

ANT 101 Introduction to Anthropology
 RC 292 Painting**
 ARC 293 Music Appreciation**
 CHE 101 Introduction to Chemistry
 ECO 103 Principles of Economics
 ENV 101 Introduction to Environmental Science
 HUM 101 World Civilization and Culture
 HUM 102 Introduction to Philosophy
 HUM 111 History of Science
 MAT 315 History of Mathematics
 MGT 211 Principles of Management
 PHY 312 Physics for Development
 POL 103 Introduction to Political Science
 POL 245 Women, Power & Politics
 PSY 101 Introduction to Psychology
 SOC 101 Introduction to Sociology
 SOC 401 Gender and Development

* 2 credits courses

** Or any other BRACU course outside major specialization with the permission of the student's advisor and the chairperson of the relevant department

Double Major in Mathematics

Students belonging to various disciplines of BRACU, specially physics, CS, CSE, ECE, ESS or any other relevant discipline desirous of doing a double major in mathematics, will have to complete a total of **67 credits**, the breakdown of which is given below:

Core Courses

Theory Courses (48 credits)

MAT 121	Basic Algebra
MAT 122	Analytical and Vector Geometry
MAT 123	Calculus I
MAT 211	Calculus II
MAT 212	Linear Algebra
MAT 221	Real Analysis I
MAT 222	Differential Equations I
MAT 223	Numerical Analysis I
MAT 311	Abstract Algebra
MAT 312	Numerical Analysis II
MAT 314	Complex Analysis
MAT 321	Real Analysis II
MAT 322	Differential Equations II
MAT 323	Vector Mechanics
MAT 324	Discrete Mathematics
MAT 325	Mathematical Methods

Lab Courses (4 credits)

MAT250	Mathematics Lab I*
MAT350	Mathematics Lab II*

* 2 credit courses

Elective Courses (12 credits)

MAT 124	FORTRAN Programming
CSE 220	Data Structures
CSE 221	Algorithms
MAT 203	Matrices, Linear Algebra & Differential Equations
MAT 313	Differential Geometry
MAT 316	Operations Research I
MAT 326	Hydrodynamics
MAT 411	Topology
MAT 415	Finite Element Methods
MAT 416	Tensor Calculus
MAT 421	Fluid Mechanics
MAT 422	Theory of Numbers
MAT 423	Mathematical Modeling
MAT 424	Operations Research II
MAT 425	Advanced Numerical Methods
PHY 112	Principles of Physics II
PHY 204	Classical Mechanics and Special Theory of Relativity
PHY 205	Statistical Mechanics
PHY 303	Quantum Mechanics
PHY 413	General Theory of Relativity
STA 301	Modern Probability Theory & Stochastic Processes

or any other mathematics course with the permission of the Chairperson of the MNS Department.

Project/Thesis (3 credits)

MAT 400	Project/Thesis
---------	----------------

The project/thesis work should be in line with one of the majors or on some interactive topic involving the two majors.

Minor in Mathematics

Mathematics will also be offered as a minor for students doing a major in physics, CS, CSE, ECE, ESS or any other relevant discipline. Such major-minor combination will stand the students in good stead in the job market. The details of the minor in mathematics program are given below:

Total Credit Requirement: 27 credits

There will be seven compulsory courses, each of three credits, which are as follows:

MAT 111 Principles of Mathematics

MAT 211 Calculus II

MAT 221 Real Analysis I

MAT 223 Numerical Analysis I

MAT 311 Abstract Algebra

MAT 316 Operations Research I

MAT 322 Differential Equations II

Students may choose any two courses from the following list of elective courses each of three credits offered by the MNS Department.

MAT 312 Numerical Analysis II

MAT 321 Real Analysis II

MAT 325 Mathematical Methods

MAT 326 Hydrodynamics

MAT 411 Topology

MAT 415 Finite Element Methods

MAT 416 Tensor Calculus

MAT 421 Fluid Mechanics

MAT 422 Theory of Numbers

MAT 423 Mathematical Modeling

MAT 424 Operations Research II

MAT 425 Advanced Numerical Methods

or any other mathematics course with the permission of the Chairperson of the MNS Department.

BRAC Business School

The BRAC Business School began its journey in 2001 as a department within BRAC University before being turned into the school in 2006. Within this short period the school has made its mark as a centre of excellence in the academic and business community through a rigorous, discipline-based approach to business education. The goal of the school is to transform the students into confident and efficient professionals who can become leaders as they shape their organizations in this age of rapid discontinuous changes.

The school has four distinct programs i.e. BBA, MBA, EMBA and MBM catering to different segments of the market. Though the programs vary in pedagogy, they have one common goal of creating professionals for business organizations. The students go through various processes from class room lectures to interactive case sessions to delving in real life situations as they are attached to organizations for case work plus a semester long internship. The activities are further supplemented by industrial visits, special lectures by business professionals and a compulsory residential semester in a cross-disciplinary environment where students of different backgrounds participate and compete.

The Director leads the activities of the school with the support of the program directors of programs i.e., the BBA, MBA, EMBA and MBM. The faculty together with the staff creates an informal yet intense environment within which the students learn and grow.

DESCRIPTION OF PROGRAM

BACHELOR OF BUSINESS ADMINISTRATION (BBA)

The Bachelor of Business Administration (BBA) program of the school is a broad based program in business education covering a period of four years of full-time study followed by a 3-month internship in an external organization. During the final year of studies the students are required to choose areas of concentration (Major and Minor) among a list of alternatives. The provision for double major is also available.

The total program is divided into four modules as follows: (i) courses in general education covering fundamentals of natural and social sciences, languages and liberal art subjects (ii) basic business courses in Accounting, Finance, Banking and Insurance, Marketing, E-Business, Human Resource Management, Computer Information Management, and Entrepreneurship (iii) courses in concentration areas to enable the students acquire skill in particular areas of business in terms of career objectives (iv) internship.

At the end of the program the normal progression for majority of the students is entry-level executive positions. Although the majority of graduates pursue career primarily in business organizations and financial institutions, a large number also opt for organizations like utility companies, autonomous bodies, international agencies and government. And then there are graduates who want to start something of their own.

Requirements for the Degree

To earn a BBA degree a student must complete at least 130 credits for the program that includes a compulsory internship in an external organization. The following is a description of how these credits are distributed among the courses.

- a. 7 courses totaling 21 credits in the area of humanities, social and natural sciences
- b. 9 courses totaling 27 credits in courses outside Business
- c. 18 courses totaling 54 credits in foundation & core courses of business
- d. 5 courses totaling 15 credits in the major and 3 courses of 9 credits for a concentration minor in business
- e. A 3-month internship consisting of 4 credits at the end of all courses
- f. A minimum CGPA of 2 throughout the program

Program Structure

The structure of the BBA Program is presented in the table below:

Areas	No. of Courses	Credit Hours
General Education (Basic Requirement)	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Allied Courses (Non-business)	9	27
Foundation & Core Courses (business)	18	54
Elective Courses (concentration)	8	24
a) Major	5	15
b) Minor	3	9
Internship	-	4
Total	42	130

A student may also be required to take non-credit, remedial courses in English to make up his/her deficiency.

General Education Courses

These courses are given to provide the BBA students some basic education in mathematics, natural sciences, and an overview of our country, Bangladesh. A special focus is also given on English language and Ethics and Culture.

Allied Courses

The BBA students are required to take these courses as they provide foundation for the upcoming core courses of business. They are required to take these courses to understand the concepts used in future business courses better.

Foundation & Core Courses

These are the fundamental and core courses of business. These courses enable the students to master the language and concepts of business, use tools and techniques of analysis and familiarize themselves with the environment of business. Functional courses are also included here that focus on the internal operations of business organizations. The students will be acquainted with the activities, issues and decisions involved in each function and how to manage the functions effectively so that they contribute to the overall business performance

and profit. Finally, after most core and major courses have been completed, students will take the capstone course of Strategic Management that helps the students integrate insight across core courses and functional areas, gain an understanding of the entire business in its environmental context and formulate strategies and policies for the company to attain competitive advantage.

Elective Courses (Concentration)

The elective courses may be chosen from any of the nine areas of concentration as given below. The number of courses taken in an area, as per program structure, determines the major and minor areas of concentration corresponding to areas of specialization.

➤ **Accounting**

This area focuses on financial accounting, managerial and cost accounting, tax planning, auditing, international accounting, accounting for decision-making and control and accounting for mergers and acquisitions. The courses prepare students for careers in both public and private accounting.

➤ **Computer Information Management (CIM)**

The area focuses on the use of computers in management, on how to organize and use information to make an organization perform efficiently and effectively. The courses prepare students for careers in information and management of technology.

➤ **E-Business**

This major provides students with an additional capability to understand analyze and participate in electronic commerce and electronic business activities in new and established firms.

➤ **Entrepreneurship**

This concentration will shape the future entrepreneurs to understand the concepts and practical issues one will deal with. It provides a diverse set of options for students to hone their entrepreneurial skills.

➤ **Finance**

Here, students will get a broad introduction to financial markets and to the tools financial managers use. It aims to prepare students for careers in commercial or investment banks, non-banking financial institutions and corporations.

➤ **Banking and Insurance**

In addition to learning different banking procedures and practices, the concentration will include the techniques useful to corporations, organizations, and individuals in minimizing the potential financial losses arising from their exposure to risk. Students will be prepared for positions with national and multi-national banks, insurance companies, and corporate risk management departments.

➤ **Human Resource Management**

This is a growing area of study and practice in Bangladesh. Students concentrating in this field will learn different personnel management techniques, regulations regarding labor and human rights and overall management of the human resources.

➤ **Marketing**

This popular concentration offers a solid ground for understanding consumer and organizational buying patterns, as well as practical experience in areas such as new product development, advertising, and retailing. Students prepare for work in brand management, sales, marketing research and consulting, as well as entrepreneurial ventures.

➤ **Operations Management**

Here students will focus on the effective planning, scheduling, use and control of a manufacturing or service organization through the study of concepts from design engineering, industrial engineering, management information systems, quality management, production management, and inventory management. Students will be prepared for positions in the business field of production and telecommunication.

Major

A student will have to take 15 credits from any of the above areas to qualify for a major.

Minor

The requirement for a minor in the school is 9 credits. However, a student may select a minor from another school/department of the University. The requirement for a minor in other department can be different in terms of credits required and students should check this requirement from the concerned department.

Internship

Once the student has acquired a total of at least 90 credits, he/she is ready to go for the internship. The internship aims at providing an on-the-job exposure to the students and an opportunity for translation of theoretical concepts in real life situation. Students are placed in business enterprises, NGOs and research institutions for internship. The duration of the internship program is 10 weeks of organizational attachment and 2 weeks of report finalization work. The report is graded and a student must get at least C grade, which is the passing grade in the internship program. Failure to obtain passing grade will require the student to repeat the internship.

List of Courses

General Education (Basic Requirement): 21 Credits

a) Science Compulsory courses: (6 credits)

- MAT 101 Fundamentals of Mathematics
- CSE 101 Introduction to Computers Science

Students are required to take one course from the following: (3 credits)

- PHY 101 Introduction to Physics
- BIO 101 Concepts of Biology (Theory)

b) Arts and Humanities: (9 credits)

- ENG 101 English Fundamentals
- ENG 102 English Composition
- HUM 103 Ethics and Culture

c) Social Science: (3 credits)

- DEV 101 Bangladesh Studies

Allied Courses (Courses outside Major Area): 27 Credits

- STA 101 Introduction to Statistics
- ECO 101 Introduction to Micro Economics
(Students must complete Math 101 before they are eligible to take this course)

Any one of the three

- MSC141 C Programming for Business
- MSC142 Visual Basic Programming for Business
- CSE110 Programming Languages
- ECO 201 Math. For Business & Economics

GEO 101 Introduction to Economic Geography
 ECO 102 Introduction to Macro Economics
 ECO 202 Statistics for Business and Economics

Any one of the two

HUM 101 World Civilization and Culture
 HUM 102 Introduction to Philosophy

Any one of the two

SOC 101 Introduction to Sociology
 PSY 101 Introduction to Psychology

Foundation & Core Courses (compulsory): (54 credits)

Foundation

Area	Subject	Prerequisite
Accounting	ACT 201: Financial Accounting	
Business	BUS 101: Introduction to Business BUS 203: Business Environment	BUS 101
Management	MGT 211: Principles of Management	BUS 101
Marketing	MKT 201: Principles of Marketing	BUS 101

Core

Area	Subject	Prerequisite
Accounting	ACT 202: Management Accounting	ACT 201
Business	BUS 201: Business & Human Communication BUS 202: Business Law BUS 302: Research Methods in Business and Management BUS 301: International Business BUS321: Entrepreneurship Process and Principles	ENG 101, ENG 102 BUS 101 BUS 101, MAT 101, ECO 202, STA 101, ECO 101, ECO 102, ECO 201, DEV 101 ECO101, ECO102, FIN 301, MKT301, DEV 101 FIN 301, MKT 301, DEV 101
Finance	FIN 301: Financial Management	BUS 101, ACT 201M, MAT 101, DEV 101
Management	MGT 201: Organizational Behaviour MGT 301: Human Resource Management MGT 401: Business Strategy	BUS101 MGT211, MGT 201, DEV 101 MGT 301, MKT 301, BUS 301 DEV 101, MSC 301, FIN 301 BUS 321, MGT 211, HRM 301
Marketing	MKT 301: Marketing Management	MKT 201, MGT 201, DEV 101
MIS	CSE 371: Management Information System	MAT 101, MGT 211, CSE 101, BUS 101, DEV 101
Operations Management	MSC 301: Operations Management	MAT 101, ECO 202, ECO 201 MGT 211, DEV 101

Elective Courses (Major/Minor)

Each subject area is divided into two parts i.e. compulsory and elective. The compulsory courses are obligatory. For major in an area a student has to take at least 15 credits including the compulsory courses. For minor in an area the requirement is 9 credits with or without the compulsory courses.

Accounting

Compulsory courses

- ACT 422 Cost Accounting
- ACT 301 Intermediate Accounting
- ACT 431 Advanced Accounting

Elective Courses

- ACT 423 Fundamentals of Taxation
- ACT 421 Accounting Information System
- ACT 425 Principles of Auditing
- ACT 432 International Accounting
- ACT 434 Accounting for Specialized Institutions

Computer Information Management (CIM)

Compulsory Courses

- MSC 444 Systems Analysis
- MSC 445 Management of Information Systems
- MSC 443 Applied Database Management

Elective Courses

- ACT 421 Accounting Information System
- MSC442 Information Technology
- MSC449 Business Data Communications
- MSC 451 Local Area Network Administration
- MSC452 Distributed Information Systems For Business

E-Business

Compulsory Courses

- MSC 441 Introduction to Electronic Commerce
- MSC 446 Marketing on the Internet
- MSC 452 E-Commerce Programming

Elective Courses

- MSC 453 E-Business Accounting
- MSC 447 Technology Fundamentals of Electronic Commerce
- MSC 448 Management of Online Business
- MSC 455 Java Programming for the Internet
- MSC 456 E-Commerce Infrastructure
- MSC 457 E-Commerce Risk and Security Management
- MSC 458 Cyber law
- MSC 459 Designing Web Usability
- MSC 454 Managing e-Commerce Projects

Entrepreneurship

Compulsory courses

- BUS 421 Venture Development
- FIN 422 Project Appraisal & Management
- MKT 428 Strategic Marketing

Elective Courses

- MGT 422 Small Business Management
- MSC 421 Productivity Management
- BUS 423 Business Plan Development

Finance, Banking and Insurance

Compulsory courses

- FIN 421 Corporate Finance I
- FIN 427 Corporate Finance II
- FIN 424 Management of Financial Institutions

Elective Courses

- FIN 425 International Financial Management
- FIN 422 Project Appraisals and Management
- FIN 423 Securities Analysis & Portfolio Management
- ACT423 Fundamentals of Taxation
- FIN441 Bank Management and Electronic Banking
- FIN 461 Insurance and Risk Management
- FIN 431 Financial Derivatives
- FIN428 Real Estate Finance

Human Resource Management

Compulsory courses

- MGT 425 Man Power Planning and Forecasting
- MGT 423 Training and Development
- MGT 424 Industrial Relations

Elective Courses

- MGT 422 Compensation Management
- MGT 426 Change Management
- MGT 427 Strategic Human resource Management
- MGT 421 Leadership: Theory Practice
- MGT 431 Industrial Psychology

Marketing

Compulsory courses

- MKT 426 Basic Marketing Research
- MKT 421 Introduction to Consumer Behaviour
- MKT 425 International Marketing

Elective Courses

MKT 422 Selling and Salesmanship
MKT 429 Business Logistics
MSC 423 Brand Management
MKT 424 Advertising
MKT 427 Retailing
MKT 428 Strategic Marketing
MKT 431 Services Marketing
MKT 432 Channel Marketing

Operations Management**Compulsory Courses**

MSC 424 Operations Research (Quantitative Methods For Decision Making)
MSC 427 Operations Planning and Control
MSC 422 Total Quality Management

Electives

MSC 445 Management of Information Systems
MSC 425 Materials Management
MSC 428 Managing Process Improvement
MSC 429 Service Quality Management
MSC 431 Operations Design and Logistics System
MSC 421 Productivity Management
MKT 429 Business Logistics

MINOR IN BUSINESS (for the students of other departments)**Total of 21 credits from the following segments**

Prerequisites: (9 credits): STA 101, ECO 101, ECO 102

a. Compulsory courses (15 credits):

BUS 101 Introduction to Business
ACT 201 Financial Accounting
MGT 211 Principles of Management
MGT 201 Organizational Behaviour
MGT 301 Human Resource Management

b. Elective any two courses from the following (6 credits)

BUS 202 Business Law
ACT 202 Management Accounting
MKT 201 Principles of Marketing
FIN 301 Financial Management
MSC 301 Operations Management
CSE 371 Management Information System
MGT 401 Business Strategy

School of Engineering and Computer Science

The Department of Computer Science and Engineering was established in April 2001. From the time of its establishment, this department offers undergraduate programs on Computer Science (CS) and Computer Science and Engineering (CSE). In 2005, the Department of Computer Science and Engineering started undergraduate program in Electronics and Communication Engineering (ECE). The Department of Computer Science and Engineering is renamed as the School of Engineering and Computer Science in 2009. Under the School of Engineering and Computer Science, there are now two departments: the Department of Electrical and Electronic Engineering (EEE) and the Department of Computer Science and Engineering (CSE).

The Department of Computer Science and Engineering currently offers the following degrees:

Bachelor of Science in Computer Science (BSCS)
Bachelor of Science in Computer Science and Engineering (BSCSE)

At present the Department of Electrical and Electronic Engineering offers the following degrees:

Bachelor of Science in Electronics and Communication Engineering (BSECE)
Bachelor of Science in Electrical and Electronic Engineering (BSEEE)

The goal of this school is to produce well-rounded and well-balanced graduates who can use Electrical, Electronics and Communication Engineering and/or Computer Science and Engineering tools to solve real world problems.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Department of Computer Science and Engineering offers Bachelor of Science (BS) degree in Computer Science (CS) and Bachelor of Science (BS) degree in Computer Science and Engineering (CSE).

DESCRIPTION OF PROGRAMS

BACHELOR OF SCIENCE IN COMPUTER SCIENCE (BS CS)

Introduction

Modern computer systems, such as the Internet, distributive systems, artificial intelligence, etc, are bringing a revolution in the lives of business and individuals. Today, a computer system has the potential of offering solutions such as e-education, e-learning, e-commerce added to the generally accepted e-mail as a means of fast communication. These are recent solutions provided by the subject of Computer Science. The global economy relies increasingly on well-designed computer systems and other digital devices across the world. All aspects of business, from research and development to production, marketing and sales, benefit from the rapid advances in such technology. Our social lives, entertainment and education are also enhanced by continuing advances in software development, system management, networking, information exchange and seamless connectivity between equipments.

The problems in the developing world are more pressing than the problems of the developed world. How well a computer system has solved a problem depends on how well the concerned professional has tailored the hardware and software to suit the needs of the situation or subject at hand. To do this effectively, the professional has not only to understand the nature of hardware

and software, but has, to some extent, be conversant with the problem to which the solution is being applied. The problem would generally be a business related problem, but could also be a technological or social one.

Objective of the Degree

The objective of the degree is to produce a well-rounded and well-balanced graduate who can use Computer Science tools to solve real world problems. In designing the course, the requirements of IEEE and standards laid down by American, Canadian and British universities and institutes have been taken into consideration.

Keeping the Course Up-to-date

With the passing of each year, the application of computers reaches new dimensions. This necessitates regular review of the syllabus. Required updating will normally be done every two years.

Structure of the Bachelor Degree in Computer Science

The Bachelor Degree in Computer Science (CS) consists of general education courses, mathematics courses, computer core courses, elective courses, courses outside major area and an internship/thesis. Each student is required to successfully complete a minimum of 124 credit hours to graduate. The student is required to take courses of 120 credits. The remaining 4 credits will be made up of project/thesis submission. A student may also be required to take remedial and supplementary non-credit courses to improve study skills, presentation and communication skills.

Areas	Number of Courses	Credit Hours
Basic Requirements (General Education)	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (CS Courses)	16	48
Courses Outside Major Area	9	27
Free Elective Courses	8	24
Thesis / Project / Internship	1	4
Total	41	124

Credit Hours

The areas and titles of the courses for each year are given on subsequent pages. The curriculum has been based on the semester system, with three semesters each year. Each semester consists of 13 weeks of work. Credit hours have been based on the number of hours of theory lectures that need to be delivered in a week. One theory lecture of one hour per week throughout the semester means 1 Credit hour. Computer Science courses that require laboratory work include 3 hours of compulsory lab (practical) work each/alternate week. This is in addition to the theory hours. As the lab work is counted as an integral part of the course, no additional credits are given for the lab hour. For these practical based courses, 3 hours theory + 3 hours lab work = 3 credit hours. All subjects have compulsory tutorial classes either integrated with lab or separate. Marks are awarded for submission of worksheets after the tutorial period.

LIST OF COURSES

1. General Education Courses [21 credits]

(Compulsory for all students unless exempted to take higher level/alternative courses)

ENG 091	Basic English (non-credit)
ENG 101	English Fundamentals (3 credits)
ENG 102	English Composition (3 credits)
CSE 110	Programming Language I (3 credits)
MAT 110	Mathematics I: Differential Calculus & Co-ordinate Geometry (3 credits)
DEV 101	Bangladesh Studies (3 credits)
HUM 103	Ethics and Culture (3 credits)
PHY 111	Principles of Physics I (3 credits)

2. Course Requirements for The Computer Science Major [52 credits]

CSE 111	Programming Language II (3 credits)
CSE 220	Data Structures (3 credits)
CSE 221	Algorithms (3 credits)
CSE 230	Discrete Mathematics (3 credits)
CSE 260	Digital Logic Design (3 credits)
CSE 321	Operating System (3 credits)
CSE 330	Numerical Methods (3 credits)
CSE 331	Automata and Computability (3 credits)
CSE 340	Computer Architecture (3 credits)
CSE 370	Database Systems (3 credits)
CSE 400	Project & Thesis (4 credits)
CSE 420	Compiler Design (3 credits)
CSE 421	Computer Networks (3 credits)
CSE 422	Artificial Intelligence (3 credits)
CSE 423	Computer Graphics (3 credits)
CSE 470	Software Engineering (3 credits)
	One 3 credit CSE elective (3 credits)

CS course (48 credits) + Project (4 credits) = 52 credits

3. Courses Outside the Department [27 credits]

(Following courses are recommended and remaining credits to be made up by students by taking courses from other departments in consultation with their Academic Advisors)

MAT 120	Mathematics II: Integral Calculus and Differential Equations (3 credits)
MAT 215	Mathematics III: Complex Variables & Laplace Transformations (3 credits)
MAT 216	Mathematics IV: Linear Algebra & Fourier Analysis (3 credits)
STA 201	Elements of Statistics and Probability (3 credits)

4. ELECTIVE COURSES [24 credits]

(Following courses are recommended and remaining credits to be made up by students by taking courses from his/her major department or other departments in consultation with their Academic Advisors to do major or minors, if desired)

PHY 112	Principles of Physics II (3 credits)
---------	--------------------------------------

A list of Elective Courses from the CSE Department

CSE 250	Circuits and Electronics (3 credits)
CSE 251	Electronic Devices and Circuits (3 credits)

CSE 310	Object Oriented Programming (3 credits)
CSE 320	Data Communications (3 credits)
CSE 341	Microprocessors (3 credits)
CSE 342	Computer Systems engineering (3 credits)
CSE 350	Digital Electronics and Pulse Techniques (3 credits)
CSE 360	Computer Interfacing (3 credits)
CSE 371	Management Information Systems (3 credits)
CSE 390	Technical Communication (3 credits)
CSE 391	Programming for the Internet (3 credits)
CSE 392	Signals and Systems (3 credits)
CSE 410	Advance Programming In UNIX (3 Credits)
CSE 419	Programming Languages (3 Credits)
CSE 424	Pattern Recognition (3 credits)
CSE 425	Neural Networks (3 credits)
CSE 426	Basic Graph Theory (3 credits)
CSE 427	Machine Learning (3 credits)
CSE 428	Image Processing (3 credits)
CSE 429	Basic Multimedia Theory (3 credits)
CSE 430	Digital Signal Processing (3 credits)
CSE 431	Natural Language Processing (3 Credits)
CSE 432	Speech Recognition and Synthesis (3 Credits)
CSE 460	VLSI Design (3 credits)
CSE 461	Digital System Design (3 credits)
CSE 462	Fault Tolerant Systems (3 credits)
CSE 471	Systems Analysis and Design (3 credits)
CSE 472	Human Computer Interface (3 credits)
CSE 473	Decision Support System (3 credits)
CSE 474	Simulation and Modeling (3 credits)
CSE 490	WAN Routing and Technologies (Special Topics) (3 credits)
CSE 490	Special Topics (3 credits)
CSE 491	Independent Study (3 credits)

The Computer Science major thus requires a total of 48 pure Computer Science (CS) course credits and a four-credit senior internship/project. This is in accordance with the UGC approved curriculum. The approved curriculum stipulates a total of 124 credits for the Bachelor of Science degree. A student doing a CS major is free to use the remaining 72 credits to fulfill the University's general education and other requirements such as complete voluntary minors. As is customary in liberal arts education, a student needs about half of the total credits to complete the major requirements.

Computer Science Minor

Students from other departments or programs (for example, ECE, EEE students) may choose to complete a minor in Computer Science to increase their experience in this important and practical subject beyond fundamentals and introductory courses. The structure of the minor is similar to the major and is a subset of it. This requires seven core courses and at least two CSE elective at the 200-level or above to complete the minor.

Course requirements for Minor [27 credits]

(For students of other departments or programs)

CSE 110	Programming Language I (3 credits)
CSE 111	Programming Language II (3 credits)

CSE 220 Data Structures (3 credits)
CSE 221 Algorithms (3 credits)
CSE 230 Discrete Mathematics (3 credits)
CSE 260 Digital Logic Design (3 credits)
CSE 340 Computer Architecture (3 credits)
Two 3 credit CSE elective (6 credits)

BACHELOR OF SCIENCE (BS) IN COMPUTER SCIENCE AND ENGINEERING (BS CSE)

Introduction

Modern computer systems, such as the Internet, distributive systems, artificial intelligence, computer graphics, etc, are bringing a revolution in the lives of business and individuals. Today, a computer system has the potential of offering solutions such as e-education, e-learning, e-commerce added to the generally accepted e-mail as a means of fast communication. These are recent solutions provided by the subject of Computer Science and Engineering. The global economy relies increasingly on well-designed computer systems and other digital devices across the world. All aspects of business, from research and development to production, marketing and sales, benefit from the rapid advances in such technology. Our social lives, entertainment and education are also enhanced by continuing advances in software development, system management, networking, information exchange and seamless connectivity between equipments.

The problems in the developing world are more pressing than the problems of the developed world. How well a computer system has solved a problem depends on how well the concerned professional has tailored the hardware and software to suit the needs of the situation or subject at hand. To do this effectively, the professional has not only to understand the nature of hardware and software, but has, to some extent, be conversant with the problem to which the solution is being applied. The problem would generally be a business related problem, but could also be a technological or social one.

Objective of the Degree

The objective of the degree is to produce a well-rounded and well-balanced graduate who can use Computer Science and Engineering tools to solve real world problems. In designing the course, the requirements of IEEE and standards laid down by American, Canadian and British universities and institutes have been taken into consideration.

Keeping the Course Up-to-date

With the passing of each year, the application of computers reaches new dimensions. This necessitates regular review of the syllabus. Required updating will normally be done every two years.

Structure of the Bachelor Degree in Computer Science and Engineering

The Bachelor Degree in CSE consists of general education courses, mathematics courses, computer core courses, elective courses, courses outside major area and an internship/thesis. Each student is required to successfully complete a minimum of 136 credit hours to graduate. The student is required to take courses of 132 credits. The remaining 4 credits will be made up of project/thesis submission. A student may also be required to take remedial and supplementary non-credit courses to improve study skills, presentation and communication skills.

Areas	Number of Courses	Credit Hours
Basic Requirements (General Education)	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (CSE Courses)	20	60
Courses Outside Major Area	9	27
Free Elective Courses	8	24
Thesis / Project / Internship	1	4
Total	45	136

Credit Hours

The areas and titles of the courses for each year are given on subsequent pages. The curriculum has been based on the semester system, with three semesters each year. Each semester consists of 13 weeks of work. Credit hours have been based on the number of hours of theory lectures that need to be delivered in a week. One theory lecture of one hour per week throughout the semester means 1 Credit hour. Computer Science and Engineering courses that require laboratory work include 3 hours of compulsory lab (practical) work each/alternate week. This is in addition to the theory hours. As the lab work is counted as an integral part of the course, no additional credits are given for the lab hour. For these practical based courses, 3 hours theory + 3 hours lab work = 3 credit hours. All subjects have compulsory tutorial classes either integrated with lab or separate. Marks are awarded for submission of worksheets after the tutorial period.

LIST OF COURSES

1. General Education Courses [21 credits]

(Compulsory for all students unless exempted to take higher level/alternative courses)

- ENG 091 Basic English (non-credit)
- ENG 101 English Fundamentals (3 credits)
- ENG 102 English Composition (3 credits)
- CSE 110 Programming Language I (3 credits)
- MAT 120 Mathematics II Integral Calculus and Differential Equations (3 credits)
- DEV 101 Bangladesh Studies (3 credits)
- HUM 103 Ethics and Culture (3 credits)
- PHY 111 Principles of Physics I (3 credits)

2. Course Requirements For The Computer Science and Engineering Major [64 credits]

- CSE 111 Programming Language II (3 credits)
- CSE 220 Data Structures (3 credits)
- CSE 221 Algorithms (3 credits)
- CSE 230 Discrete Mathematics (3 credits)
- CSE 250 Circuits and Electronics (3 credits)
- CSE 251 Electronic Devices and Circuits (3 credits)
- CSE 260 Digital Logic Design (3 credits)
- CSE 320 Data Communications (3 credits)
- CSE 321 Operating System (3 credits)
- CSE 330 Numerical Methods (3 credits)
- CSE 331 Automata and Computability (3 credits)

CSE 340 Computer Architecture (3 credits)
CSE 341 Microprocessors (3 credits)
CSE 350 Digital Electronics and Pulse Techniques (3 credits)
CSE 370 Database Systems (3 credits)
CSE 400 Project & Thesis (4 credits)
CSE 420 Compiler Design (3 credits)
CSE 421 Computer Networks (3 credits)
CSE 422 Artificial Intelligence (3 credits)
CSE 423 Computer Graphics (3 credits)
One 3 credit CSE elective (3 credits)
CSE course (60) + Project (4) = 64 credits

3. Courses outside the department [27 credits]

(The credits to be made up by students by taking courses from other departments in consultation with their Academic Advisors)

MAT 110 Mathematics I: Differential Calculus & Co-ordinate Geometry (3 credits)

4. Elective courses [24 credits]

Following courses are recommended and remaining credits to be made up by students by taking courses from his/her major department or other departments in consultation with their Academic Advisors to do major or minors, if desired

CSE 360 Computer Interfacing (3 credits)
CSE 460 VLSI Design (3 credits)
CSE 461 Digital System Design (3 credits)
CSE 470 Software Engineering (3 credits)
CSE 471 Systems Analysis and Design (3 credits)
MAT 215 Mathematics III: Complex Variables & Laplace Transformations (3 credits)
MAT 216 Mathematics IV: Linear Algebra & Fourier Analysis (3 credits)
PHY 112 Principles of Physics II (3 credits)

A list of Elective Courses from the CSE Department:

CSE 310 Object Oriented Programming (3 credits)
CSE 342 Computer Systems engineering (3 credits)
CSE 360 Computer Interfacing (3 credits)
CSE 371 Management Information Systems (3 credits)
CSE 390 Technical Communication (3 credits)
CSE 391 Programming for the Internet (3 credits)
CSE 392 Signals and Systems (3 credits)
CSE 410 Advance Programming In UNIX (3 Credits)
CSE 419 Programming Languages (3 Credits)
CSE 424 Pattern Recognition (3 credits)
CSE 425 Neural Networks (3 credits)
CSE 426 Basic Graph Theory (3 credits)
CSE 427 Machine Learning (3 credits)
CSE 428 Image Processing (3 credits)
CSE 429 Basic Multimedia Theory (3 credits)
CSE 430 Digital Signal Processing (3 credits)
CSE 431 Natural Language Processing (3 Credits)
CSE 432 Speech Recognition and Synthesis (3 Credits)
CSE 460 VLSI Design (3 credits)
CSE 461 Digital System Design (3 credits)
CSE 462 Fault Tolerant Systems (3 credits)
CSE 470 Software Engineering (3 credits)

- CSE 471 Systems Analysis and Design (3 credits)
- CSE 472 Human Computer Interface (3 credits)
- CSE 473 Decision Support System (3 credits)
- CSE 474 Simulation and Modeling (3 credits)
- CSE 490 WAN Routing and Technologies (Special Topics) (3 credits)
- CSE 490 Special Topics (3 credits)
- CSE 491 Independent Study (3 credits)

The Computer Science and Engineering major thus requires a total of 60 pure Computer Science and Engineering (CSE) course credits and a four-credit senior internship/project. The approved UGC curriculum stipulates a total of 136 credits for the Bachelor of Science degree. A student doing a CSE major is free to use the remaining 72 credits to fulfill the University's general education and other requirements such as complete voluntary minors. As is customary in liberal arts education, a student needs about half of the total credits to complete the major requirements.

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING (EEE)

The Department of Electrical and Electronic Engineering offers Bachelor of Science (BS) degree in Electronics and Communication Engineering (ECE) and Bachelor of Science (BS) degree in Electrical and Electronic Engineering (EEE).

DESCRIPTION OF PROGRAMS

BACHELOR OF SCIENCE (BS) IN ELECTRONICS AND COMMUNICATION ENGINEERING

Introduction

Modern communication systems, such as the Internet, mobile telephones and digital TV, are bringing a revolution in the lives of business and individuals. The global economy relies increasingly on high-speed data and other digital data networks interconnecting computers and other digital devices across the world. All aspects of business, from research and development to production, marketing and sales, benefit from the rapid advances in such technology. Our social lives, entertainment and education are also enhanced by continuing advances in personal and mobile communications, media compression and seamless connectivity between equipments.

Objective of the Degree

The objective of the degree is to produce a well-rounded and well-balanced graduate who can use Electronics and Communication Engineering tools to solve real world problems. In designing the course, the requirements of IEEE and curricula of North American and European universities and institutes have been taken into consideration.

Keeping the Curriculum Up-to-date

With the passing of each year, Electronics and Communication Engineering reaches new dimensions, which necessitates regular review of the curriculum. Required updating will normally be done every two to three years.

Structure of the Bachelor Degree in Electronics and Communication Engineering (ECE)

The Bachelor of Science Degree in ECE consists of general education courses, mathematics courses, Electronics and Communication Engineering core courses, courses outside the EEE department, elective courses and a thesis/project. Each student is required to successfully complete a minimum of 124 credit hours to graduate. The student is required to take courses of

120 credits. The remaining 4 credits will be made up of thesis/project submission. A student may also complete an optional non-credit Internship course. The duration of internship will be a maximum of 8 weeks. A student may also be required to take remedial and supplementary non-credit courses to improve study skills, presentation and communication skills.

Areas	Number of Courses	Credit Hours
Basic Requirements (General Education)	7	21
a) Science	3	9
b) Arts	3	9
c) Social Science	1	3
Major Area (ECE Courses)	17	51
Courses Outside Major Area	9	27
Free Elective Courses	7	21
Thesis / Project / Internship	1	4
Internship (Non-credit and Optional)	-	0
Total	41	124

Credit Hours

The areas and titles of the courses for each year are given on subsequent pages. The curriculum has been based on the semester system, with three semesters each year. Each semester consists of 13 weeks of work. Credit hours have been based on the number of hours of theory lectures that need to be delivered in a week. One theory lecture per week throughout the semester means 1 credit hour. Electronics and Communication Engineering courses that require laboratory work include 3 hours of compulsory practical work each/alternate week. This is in addition to the theory hours. As the practical work is counted as integral part of the course, no additional credits are given for the practical. For these practical based courses, 3 hours theory + 3 hours practical work = 3 credit hours. Many courses have compulsory tutorial classes, which are either integrated with the lab (if any) or held separately. Marks will be awarded for submission after the tutorial period.

LIST OF COURSES

1. General Education Courses [21 credits]

(Compulsory for all students unless exempted to take higher level/alternative courses)

- ENG 091 Basic English (non-credit)
- ENG 101 English Fundamentals (3 credits)
- ENG 102 English Composition (3 credits)
- CSE 110 Programming Language I (3 credits)
- MAT 110 Mathematics I: Differential Calculus & Co-ordinate Geometry (3 credits)
- DEV 101 Bangladesh Studies (3 credits)
- HUM 103 Ethics and Culture (3 credits)
- PHY 111 Principles of Physics I (3 credits)

2. Course Requirements For The Electronics and Communication Engineering (ECE) Major [55 credits]

- CSE 260 Digital Logic Design (3 credits)
- ECE 200 Electrical Circuits I (3 credits)

- ECE 201 Electrical Circuits II (3 credits)
- ECE 202 Electronic Devices and Circuits I (3 credits)
- ECE 203 Electronic Devices and Circuits II (3 credits)
- ECE 210 Electromagnetic Waves and Fields (3 credits)
- ECE 220 Signals and Systems (3 credits)
- ECE 230 Semiconductor Devices and Materials (3 credits)
- CSE 320 Data Communications (3 credits)
- CSE 350 Digital Electronics and Pulse Techniques (3 credits)
- ECE 310 Introduction to Communication Engineering (3 credits)
- ECE 320 Microwave Engineering (3 credits)
- ECE 328 Digital Signal Processing (3 credits)
- ECE 330 Telecommunication Switching Systems (3 credits)
- ECE 360 Measurement and Instrumentation (3 credits)
- CSE 460 VLSI Design (3 credits)
- ECE 400 Thesis/ Project (4 credits)
- ECE 421 Wireless and Mobile Communications (3 credits)

3. Courses outside the department [27 credits]

Following courses are recommended and remaining credits to be made up by students by taking courses from other departments in consultation with their Academic Advisors.

- MAT 120 Mathematics II: Integral Calculus and Differential Equations (3 credits)
- MAT 215 Mathematics III: Complex Variables & Laplace Transformations (3 credits)
- MAT 216 Mathematics IV: Linear Algebra & Fourier Analysis (3 credits)
- STA 201 Elements of Statistics and Probability (3 credits)
- PHY 112 Principles of Physics II (3 credits)
- PHY 210 Quantum Physics of Atoms, Solids and Nuclei (3 credits)

4. Elective courses [21 credits]

(Credits to be made up by taking courses from his/her major department or other departments in consultation with their Academic Advisors to do major or minors, if desired).

Students have to take at least five elective courses in Electronics and Communication Engineering areas. The remaining two elective courses should be at least Level 3 courses from relevant areas.

A List of Sample Elective Courses from the CSE and EEE Departments:

- CSE 111 Programming Language II (3 credits)
- CSE 310 Object Oriented Programming (3 credits)
- CSE 321 Operating System (3 credits)
- CSE 330 Numerical Methods (3 credits)
- CSE 340 Computer Architecture (3 credits)
- CSE 341 Microprocessors (3 credits)
- ECE 322 Multimedia Communications (3 credits)
- ECE 340 Optoelectronic Devices (3 credits)
- ECE 350 Control Systems (3 credits)
- CSE 424 Pattern Recognition (3 credits)
- CSE 425 Neural Networks (3 credits)
- CSE 428 Image Processing (3 credits)
- CSE 431 Natural Language Processing (3 credits)
- CSE 432 Speech Recognition and Synthesis (3 credits)
- CSE 461 Digital System Design (3 credits)

- ECE 410 Optical Communications (3 credits)
- ECE 422 Digital Communications (3 credits)
- ECE 423 Analog Integrated Circuit Design (3 credits)
- ECE 424 Power Electronics (3 credits)
- ECE 425 Theory and Fabrication of Integrated Circuit Devices (3 credits)
- ECE 430 Satellite Communications (3 credits)
- ECE 440 High Performance Communication Networks (3 credits)
- ECE 470 Biomedical Instrumentation (3 credits)
- ECE 471 Protocol Engineering (3 credits)
- ECE 481 Telecommunication Policy and Management (3 credits)
- CSE 490 WAN Routing and Technologies (Special Topics) (3 credits)
- ECE 490 Special Topics (3 credits)
- ECE 491 Independent Study (3 credits)

The Electronics and Communication Engineering major thus requires a total of 51 pure ECE course credits and a four-credit senior internship/project. The approved UGC curriculum stipulates a total of 124 credits for the Bachelor of Science degree. A student doing a ECE major is free to use the remaining 69 credits to fulfill the University's general education and other requirements such as complete voluntary minors. As is customary in liberal arts education, a student needs about half of the total credits to complete the major requirements

BACHELOR OF SCIENCE (BS) IN ELECTRICAL AND ELECTRONIC ENGINEERING

Introduction

Electrical and Electronic Engineering tools, such as mobile telephones, digital TV, generators, motors, computer and wireless networking are bringing a revolution in the lives of business and individuals. The global economy relies increasingly on high-speed data and other digital data networks interconnecting computers and other digital devices across the world. All aspects of business, from research and development to production, marketing and sales, benefit from the rapid advances in such technology. Continuing advances in electronics technology, personal and mobile communications, media compression and seamless connectivity between equipments also enhance our social lives, entertainment and education.

Objective of the Degree

The objective of the degree is to produce a well-rounded and well-balanced graduate who can use Electrical and Electronic Engineering tools to solve real world problems. In designing the course, the requirements of IEEE and curricula of North American and European universities and institutes have been taken into consideration.

Structure of the Bachelor Degree in Electrical and Electronic Engineering (EEE)

The Bachelor of Science Degree in Electrical and Electronic Engineering (EEE) consists of general education courses, mathematical and natural science courses, Electrical and Electronic Engineering core courses, courses outside major area, elective courses and a thesis/project. Each student is required to successfully complete a minimum of 136 credit hours with a minimum CGPA of 2.00 out of 4 to graduate. The student is required to take courses of 130 credits. The remaining 6 credits will be made up of thesis/project submission. The duration of thesis/project work will be three semesters. A student may also complete an optional non-credit Internship course. The duration of internship will be a maximum of 8 weeks. A student may also be required to take remedial and supplementary non-credit courses to improve study skills, presentation and communication skills.

Areas	Credit Hours
Basic Requirements (General Education)	22
a) Science	10
b) Arts	9
c) Social Science	3
Major Area (EEE courses)	60
Courses Outside Major Area	27
Free Elective Courses	21
Thesis / Project	6
Internship (Non-credit and Optional)	0
Total	136

Credit Hours

The areas and titles of the courses for each year are given on subsequent pages. The curriculum has been based on the semester system, with three semesters each year.

Credit hours have been based on the number of hours of theory lectures that need to be delivered in a week. Three-hour lecture per week throughout the semester means 3 credit hours. Electrical and Electronic Engineering courses that require laboratory work include 2 or 3 hours of practical work each week. Three-hour laboratory work per week throughout the semester means 1.5 credit hours. Two-hour laboratory work per week throughout the semester means 1 credit hour.

LIST OF COURSES

1. General Education Courses [22 credits]

(Compulsory for all students unless exempted to take higher level/alternative courses)

- ENG 091 Foundation Course (non-credit)
- ENG 101 English Fundamentals (3 credits)
- ENG 102 English Composition (3 credits)
- DEV 101 Bangladesh Studies (3 credits)
- HUM 103 Ethics and Culture (3 credits)
- MAT 110 Mathematics I (3 credits)
- PHY 111 Principles of Physics I (3 credits)
- CSE 161 Computer Programming (3 credits)
- CSE 162 Computer Programming Laboratory (1 credit)

2. Course Requirements for the Electrical and Electronic Engineering Major [66 credits]

- EEE 201 Electrical Circuits I (3 credits)
- EEE 202 Electrical Circuits I Laboratory (1.5 credits)
- EEE 203 Electrical Circuits II (3 credits)
- EEE 204 Electrical Circuits II Laboratory (1.5 credits)
- EEE 205 Electronic Devices and Circuits I (3 credits)
- EEE 206 Electronic Devices and Circuits I Laboratory (1.5 credits)
- EEE 207 Electronic Devices and Circuits II (3 credits)
- EEE 208 Electronic Devices and Circuits II Laboratory (1.5 credits)
- EEE 209 Semiconductor Devices and Materials (3 credits)

- EEE 221 Energy Conversion I (3 credits)
- EEE 223 Energy Conversion II (3 credits)
- EEE 224 Energy Conversion Laboratory (1.5 credits)
- EEE 241 Electromagnetic Waves and Fields (3 credits)
- EEE 243 Signals and Systems (3 credits)
- CSE 330 Numerical Methods (3 credits)
- EEE 301 Digital Electronics (3 credits)
- EEE 302 Digital Electronics Laboratory (1.5 credits)
- EEE 305 Control Systems (3 credits)
- EEE 306 Control Systems Laboratory (1.5 credits)
- EEE 341 Introduction to Communication Engineering (3 credits)
- EEE 342 Introduction to Communication Engineering Laboratory (1.5 credits)
- EEE 343 Digital Signal Processing (3 credits)
- EEE 344 Digital Signal Processing Laboratory (1.5 credits)
- EEE 365 Microprocessors (3 credits)
- EEE 366 Microprocessors Laboratory (1.5 credits)
- EEE 400 Thesis/ Project (6 credits)

3. Courses Outside Major Area [27 credits]

(Following courses are recommended and remaining credits to be made up by students by taking courses from other departments in consultation with their Academic Advisors)

- MAT 120 Mathematics II (3 credits)
- MAT 215 Mathematics III (3 credits)
- MAT 216 Mathematics IV (3 credits)
- STA 201 Elements of Statistics and Probability (3 credits)
- CHE 110 Principles of Chemistry (3 credits)
- PHY 112 Principles of Physics II (3 credits)
- ECO 105 Fundamentals of Economics (3 credits)

4. Elective Courses [21 credits]

Following courses are required and the remaining credits to be made up by students by taking courses from his/her major department or other departments in consultation with their Academic Advisors [to do major or minors, if desired]

- ACT 201 Financial Accounting (3 credits)
- MGT 211 Principles of Management (3 credits)

Students must take at least 3 theory courses from one major group listed below. Students also have to take relevant laboratory courses, if any, associated with those 3 theory courses.

A List of Elective Courses

Electronics Group

- PHY 310 Advanced Solid State Physics (3 credits)
- EEE 307 Optoelectronic Devices (3 credits)
- EEE 411 VLSI Design (3 credits)
- EEE 412 VLSI Design Laboratory (1.5 credits)
- EEE 413 Digital System Design (3 credits)
- EEE 414 Digital System Design Laboratory (1.5 credits)
- EEE 415 Analog Integrated Circuit Design (3 credits)

Power Group

- EEE 321 Power System I (3 credits)
- EEE 323 Power System II (3 credits)
- EEE 421 Power Electronics (3 credits)

- EEE 422 Power Electronics Laboratory (1.5 credits)
- EEE 423 Power Plant Engineering (3 credits)
- EEE 425 Switchgear and Protection (3 credits)
- EEE 426 Switchgear and Protection Laboratory (1.5 credits)
- EEE 427 Power System Reliability (3 credits)
- EEE 429 Power System Operation and Control (3 credits)
- EEE 431 High Voltage Engineering (3 credits)
- EEE 432 High Voltage Engineering Laboratory (1.5 credits)

Communication Group

- EEE 347 Telecommunication Switching Systems (3 credits)
- EEE 349 Microwave Engineering (3 credits)
- EEE 350 Microwave Engineering Laboratory (1.5 credits)
- EEE 361 Data Communications (3 credits)
- EEE 362 Data Communications Laboratory (1.5 credits)
- EEE 441 Wireless and Mobile Communications (3 credits)
- EEE 442 Wireless and Mobile Communications Laboratory (1.5 credits)
- EEE 443 Optical Communications (3 credits)
- EEE 444 Optical Communications Laboratory (1.5 credits)
- EEE 445 Digital Communications (3 credits)
- EEE 446 Digital Communications Laboratory (1.5 credits)
- EEE 447 Satellite Communications (3 credits)
- EEE 449 High Performance Communication Networks (3 credits)
- EEE 451 Telecommunication Policy and Management (3 credits)
- EEE 453 LAN Switching and WAN Technologies (3 credits)
- EEE 454 LAN Switching and WAN Technologies Laboratory (1.5 credits)
- EEE 455 Fundamentals of Wireless LANs (3 credits)
- EEE 456 Fundamentals of Wireless LANs Laboratory (1.5 credits)

Computer Group

- EEE 361 Data Communications (3 credits)
- EEE 362 Data Communications Laboratory (1.5 credits)
- EEE 363 Multimedia Communications (3 credits)
- CSE 340 Computer Architecture (3 credits)
- EEE 411 VLSI Design (3 credits)
- EEE 412 VLSI Design Laboratory (1.5 credits)
- EEE 413 Digital System Design (3 credits)
- EEE 414 Digital System Design Laboratory (1.5 credits)
- EEE 463 Protocol Engineering (3 credits)
- EEE 465 Computer Networks (3 credits)
- EEE 466 Computer Networks Laboratory (1.5 credits)
- CSE 425 Neural Networks (3 credits)
- CSE 428 Image Processing (3 credits)
- CSE 432 Speech Recognition and Synthesis (3 credits)

Interdisciplinary/Emerging Topics

- EEE 303 Measurement and Instrumentation (3 credits)
- EEE 304 Measurement and Instrumentation Laboratory (1.5 credits)
- EEE 401 Internship (non-credit)
- EEE 461 Biomedical Instrumentation (3 credits)
- EEE 490 Special Topics (3 credits)
- EEE 491 Independent Study (3 credits)

School of Law

Are you looking for a dynamic, stimulating environment in which to learn law and understand how law shapes our lives?

Then BRAC University School of Law is definitely for you.

Introduction

The undergraduate law program at BRAC University School of Law is designed to prepare students for careers in law - judges, lawyers, administrators, and academics - and leadership roles in tomorrow's globalised economy and society. The four academic years program would enable students to pursue a range of fundamental topics in law and legal system. Moreover, flexibility of curriculum would make it possible for them to pursue their individual academic interest in practically every area of law by selecting elective courses and topics of their own choice from one of the broadest selection available in any School of Law or University in Bangladesh.

Law is much more than principles and provisions - it is about justice, equity and fairness as well as the values around which societies organized themselves through orderly institutions. Law is also intertwined with economy, development, business and the emerging globalised order. For a jurist, law does not exist in a vacuum and law is very closely related to and interacts with other social forces and issues. Hence, a law student at the BRAC University School of Law will also take up subjects from other disciplines. In fact a law students will take 9 courses outside law - Economics, English, Development Studies and even Architecture and Photography; and the choice is wide and varied.

The School of Law is committed to remain at the forefront of preparing law professionals for today and days beyond.

Mission Statement/Objective

'To the Romans, Justice was a goddess whose symbols were a throne that tempests could not shake, a pulse that passion could not stir, eyes that were blind to any feeling of favor or ill will, and the sword that fell on all offenders with equal certainty and with impartial strength.' Now, Justice - in the name of Rule of Law is a sine-qua-non for the maintenance of peace and tranquility in a given polity. Moreover, in a society advancing rapidly, it is the law that gives the lead to society and places before it ideals and values to which people should conform. Recognizing BRAC's background, BRACU's commitment and goal, the School of Law would endeavor and strive to impart an education to seek legal solution that respects social, cultural and aesthetic needs of the people and prepare tomorrows lawyers to meet the challenges of the new millennium and the realities of globalization.

Structure of the Programme

Bachelor of Laws [LL.B. Honours] program consists of 12 semesters - 3 equal semesters every year. A student shall have to successfully complete 45 courses comprising of 6 General Education Courses, 21 Major Compulsory Law Courses including Dissertation Paper and Moot-Court Sessions, 9 Courses Outside Major Area along with 9 Elective Minor Courses. In the last semester, students would be required to participate in mock trials. Moreover, for practical orientation, towards the end of the program, students would attend courts and lawyers' chambers.

The course requirements and structure for the undergraduate Bachelor of Laws [LL.B. Honours] program is presented in the following Table:

Area	Courses	Credit Hours
General Education Course		
a) English Language	2	6
b) CSE	1	3
c) Mathematics	1	3
d) Natural Science	1	3
e) Arts or Social Science	1	3
Major Law Courses	21	63
Elective Law Courses		
a) 5 Major Concentration	5	15
b) 4 Minor Concentration	4	12
Courses Outside Major	9	27
Total	45	135

List of Courses

(a) Foundation Courses/General Education

General Education Courses: 18 Credits

The General Education Courses are compulsory in terms of BRAC University's academic requirements for undergraduate programs.

(b) Major Area

Major Law Courses: 63 Credits

Core Courses in Law

[All courses are compulsory]

- LAW 101 The Jurisprudence of Legal Concepts and the legal system of Bangladesh
- LAW 102 Obligations: Contract Law
- LAW 103 Delict: Law of Tort
- LAW 104 Constitutional Law
- LAW 201 Equitable Principles and Specific Relief
- LAW 202 Muslim Family Law and Reforms
- LAW 203 Property Law and Transfers
- LAW 204 Law of Registration and Limitation
- LAW 205 Business Law
- LAW 301 Agricultural Law and Reforms
- LAW 302 Criminal Law
- LAW 303 Company Law
- LAW 304 International Law [Public]
- LAW 305 Principles of Civil Procedure

- LAW 306 Evidence
- LAW 307 Laws on Insurance
- LAW 308 Criminal Procedure
- LAW 401 Conveyancing and Legal Writings
- LAW 402 Legal Research and Methodology [Dissertation Paper]
- LAW 403 Moot - Court Sessions
- LAW 404 Law of Trusts and Codicils

(c) Electives

Elective Law Courses: 27 Credits

The following elective courses are offered and distributed in relation to particular branch / area of law to enable students to choose their field of concentration/specialization. Thus, for example, one may opt to choose "A" from the elective courses to have a unique opportunity of concentrating on Commercial Laws. One may, however, choose to specialize in Economic Laws and prefer to study courses contained in "B" or might be inclined to know and appreciate evolution of legal theories and system of present modern world and, therefore, prefer to study "C" - Legal Philosophy, Rights and Dispute Resolution. Again, one may specialize in Estate Maintenance and Succession Laws by choosing courses under "D". Alternatively, a student may prefer to have a combination of all the above four disciplines of legal studies without concentrating in any particular field.

A: COMMERCIAL LAWS

Business and IP Matters

LAW 322 Intellectual Property Law

Law of Carriage/Law of Carriers

LAW 423 Maritime Law and Carriers

LAW 424 Inland Shipping Law

Cyber Law

LAW 425 Cyber Law

LAW 426 Legal Informatics

B: ECONOMIC LAWS

Economic Laws

LAW 331 Banking and Securities Law

LAW 332 Laws on Foreign Exchange Investment and Anti-money Laundering

Recovery and Taxation Laws

LAW 433 Public Demand Recovery and Money Loan Court Act

LAW 434 Taxation Law including Customs and VAT

LAW 435 Labour and Industrial Law

C LEGAL PHILOSOPHY, RIGHTS AND DISPUTE RESOLUTION

Philosophy of Law

LAW 341 Comparative Law

LAW 342 Legal System and Institutions

LAW 343 Criminology and Penology

Law of Rights and Dispute Resolution

- LAW 344 Alternative Dispute Resolution (ADR) and Arbitration
- LAW 345 Women, Law and Legal Protection
- LAW 346 Environmental Law
- LAW 447 Human Rights
- LAW 448 Administrative Law

D. ESTATE MAINTENANCE AND SUCCESSION LAWS

Inheritance Laws

- LAW 351 Hindu Law and Succession
- LAW 352 Succession, Social Policy and Law Reforms

Estate Maintenance Laws

- LAW 353 Law of Town planning and Environment
- LAW 453 Construction Laws

E. OTHERS

Students may also opt for independent seminar course or write a substantial paper on topics related to any of the groups of specialized elective courses.

(d) Courses outside Major for Law Students

Courses Outside Major: 27 Credits

For courses outside major students will be encouraged to pursue basic introductory courses from any discipline that would adequately prepare him/her to continue with major law courses afterwards. Students may also take introductory "Social Law Courses" (please see below) of the school itself but with prior consultation with academic advisors and the Chairperson of the School.

(e) Minor programme

Courses for doing Minor in Law [from other Departments]: 27 Credits

[All courses are compulsory]

- LAW 101 The Jurisprudence of Legal Concepts and the legal system of Bangladesh
- LAW 102 Obligations: Contract Law
- LAW 103 Delict: Law of Tort
- LAW 104 Constitutional Law
- LAW 202 Muslim Family Law and Reforms
- LAW 203 Property Law and Transfers
- LAW 302 Criminal Law
- LAW 303 Company Law
- LAW 304 International Law [Public]

SEQUENCE OF COMPULSORY LAW COURSES

(Semester wise with prerequisites))

TOTAL REQUIRED CREDITS: 135

TOTAL REQUIRED COURSES: 45

[21 Major & 24 others]

Semester	Major Courses	Pre-Req	Non-Major
1st Year			
1st	LAW 101: The Jurisprudence of Legal Concepts and the Legal System of Bangladesh		Eng 091/101 and One other
	LAW 102: Obligations: Contract Law		
2nd	TARC (Savar)		HUM, DEV, CSE, ENG
3rd	LAW 103: Delict: Law of Tort		
	LAW 201: Equitable Principals and Specific Relief		Eng 102 and One other
2nd Year			
1st	LAW 202: Muslim Family Laws and Reform	LAW 201	1 or 2 Other courses
	LAW 203: Property Law and Transfer	LAW 101, LAW 201	
	LAW 204: Laws of Registration and Limitation	LAW 102	
2nd	LAW 104: Constitutional Law	LAW101, Pol 101	1 or 2 Other courses
	LAW 205 : Business Law	LAW 102	
	LAW 301: Agricultural Law and Reforms	LAW 203, 204	
3rd	LAW 302: Criminal Law	LAW101, 104	1 or 2 Other courses
	LAW303: Company Law	LAW102, 205	
	LAW 305: Principals of Civil Procedure	LAW101, 104, 201	
3rd Year			
1st	LAW 304: International Law [Public]	LAW 101	1 or 2 Other courses
	LAW 306: Evidence	LAW 302, 305	
2nd	LAW 307: Laws on Insurance	LAW 102, 205	Law Electives
	LAW308: Criminal Procedure	LAW 302	
3rd	LAW 401: Conveyancing and Legal Writings	LAW 203, 204	Law Electives
	LAW 404: Law of Trusts and Codicils	LAW 201, 203	
4th Year			
1st	LAW 403: Moot Court Sessions		
	LAW 402: Legal Research and Methodology [Dissertation paper]		
2nd	Elective Courses (Law)		Other Courses
			{If Necessary}
3rd	Elective Courses (Law)		

The Centre for Languages, BRAC University

Through its hard work and focus on creative and forward thinking teaching concepts, the English Language Programme (EL Pro) has now become BRAC University, The Centre for Languages, (BU CfL)

BU CfL is offering a new and exciting range of languages, such as English, Chinese, French, Spanish, Japanese, Russian, and of course, Bangla. The Centre's learners include students who need a foreign language for successful admission to a graduate program, and adults who need a foreign language to be successful in the global economy. We hope to assist expatriates living in Dhaka, who need to or would like to learn Bangla.

In addition to the new services, BU CfL will continue to offer its high quality English language classes to all the university's undergraduate and graduate students. These classes are based on the students' skill level, which eliminates not only the possibility of having mixed ability classes, where some students flourish and some fail, but it also ensures small classes with excellent interaction between the teacher and learners. Also BU CfL offers pre-university classes which are designed for those students who are seeking to improve their English language skills to become successful BRAC University students. Only through successful completion of this program these students can become regular BU students.

BU CfL is looking forward to continuing its excellent relationship with the BRAC Professional Development Program, BUIED and BRAC Education Program (BRAC Primary School Teacher's Training). English language classes and training are offered to these participants to help them develop into top-level managers, mentors and teachers. Since BU CfL is playing an enormous and efficient role in teaching English, an American company named Superior Internet Solutions has recently affiliated with BU CfL in providing the most advanced Call Centre Training available in Dhaka. Open University (UK) in collaboration with BRAC University Centre for Languages (CfL) will be conducting a year long assessment of training titled 'MYTEC Training' (Make Your Teaching Experience Count) for developing secondary school teachers under English in Action (EIA), a nine year project funded by DFID.

The Centre for Languages at BRAC University will bring a whole new world of opportunities through language to the university, the community and the country.

Undergraduate Course Descriptions

Department of Architecture

Course Descriptions

The following are brief descriptions of the individual courses arranged under general headings and preferred sequence.

(There is no description provided of the elective course ARC435 – Computers in Architecture, since the subject matter of this course is still under development.)

DESIGN STUDIO COURSES

ARC 101: Design I **9 hrs/week. 4.5 credits**

Exercises in 2- dimensional basic composition using points, lines and basic shapes. Understanding order, balance, harmony, proportion, movement, rhythm. Relationships between solid and void. Concepts of space and enclosure. Use and understanding of various media and presentation formats.

ARC 102 : Design II **9 hrs/week. 4.5 credits**

Exercises in 3 dimensional composition with planes, basic shapes and forms. Understanding of colour schemes and use of colour in composition. Concepts of 3-D space. Space and enclosure. Spaces for basic functions. *Prerequisite: ARC 101*

ARC 201: Design III **9 hrs/week. 6 credits**

Human and space relationships: anthropometrics and ergonomics. Activity and space relationships: basic human functions and determination of space requirements. Space and form relationships: nature of enclosure. Development of awareness of scale and proportion. *Prerequisite: ARC 102*

ARC 202: Design IV **9 hrs/week. 6 credits**

Exploring the relationship between building function, form and structure. Analysis of the site. Setting the building. Vehicular and pedestrian circulation. Analysis of building programme and report writing. Exploring formal expression of buildings with simple functions. *Prerequisite: ARC 201*

ARC 301: Design V **12 hrs/week. 8 credits**

Design exercises on buildings with simple functional and technical requirements on sites having distinctive features requiring consideration. The emphasis is on imaginative use of form and spatial quality. *Prerequisite: ARC 202*

ARC 302: Design VI **12 hrs/weeks. 8 credits**

Design exercises involving multifunctional buildings with complexity of functional and circulation patterns and site parameters. Environmental analysis of the requirements. Formal and functional expression. Technical integration. *Prerequisite: ARC 301*

ARC 401: Design VII **15 hrs/week. 10 credits**

Design in the urban and regional context. Urban design and master planning of complexes of buildings. Reference to socio cultural aspects. Environmental impact of buildings. Means of optimising environment-building interactions. *Prerequisite: ARC 302*

ARC 402: Design VIII **15 hrs/week. 10 credits**

Focus on multi dimensional problem issues in either of two streams: Urban or rural bias. Design of urban renewal, regeneration, conservation rehabilitation projects or mass housing to include investigation of socio economic aspects.

Rural based projects focusing on development issues, architectural solutions aiming to improve the quality of life in rural areas. Rural housing and settlement/resettlement schemes. Housing for disaster prone areas. Post disaster reconstruction. Focus on innovation in construction and materials and environment friendly technology. *Prerequisite: ARC 401*

ARC 501: Design X **15 hrs/week. 12 Credits**
Identifying design tasks to specific realistic problems in an assigned setting. The project will include all design phases from formulation of the programme to preparation of preliminary working drawings. Primary emphasis will be given to the realization of a concept and also to the design quality in terms of formal, functional and structural aspects to attain professional level of achievement. *Prerequisite: ARC 402*

ARC 502: Design X **15hrs/week. 12 credits**
Thesis Stream: Identification of viable projects of significance as thesis project. Preparation of architectural programme based on investigation and research on the functions. Investigation of site and context. Environmental analysis. Preparation of a design solution based on analysis of form function and structure and with justification for the same. Emphasis on materialization of concept. The final solution should be of professionally acceptable quality. *Prerequisite: ARC 501*

Note: Students achieving a certain GPA level (determined according to batch) can take the thesis stream

ARC 503: Design Studio X (alternative to ARC502) **15hrs/week. 12 credits**
Project Stream: Design exercise of realistic complexity. Analysis of the architectural program to evolve spatial requirements and relationships. Site, contextual and environmental analysis. Final solution achieved through a series of stages of development. Final solution of professional quality supported by construction drawings. *Prerequisite: ARC 501*

STUDIOS RELATED TO DESIGN

ARC 311: Working Drawings I **3 hrs/week. 1.5 credits**
Architectural design and working drawings specifying all information needed for construction. Plans, elevations and sections and working and detail drawings of all building components. Details of drainage, damp proofing and insulation. Toilet and kitchen layouts, details of staircases, railings. *Prerequisite: ARC 202*

ARC 312: Working Drawings II: Production Drawings **3 hrs/week. 1.5 credits**
Design drawing and specifications for components of building that need to be produced for the purpose. Doors, windows, grilles, hardware, mouldings etc. Creativity in designing details emphasized through understanding of manufacturing process. *Prerequisite: ARC 311*

ARC 411: Interior Design **3 hrs/week. 1.5 credits**
Exploring ideas in interior design. Expression of purpose in interiors. Interior design of various types of spaces. Study of materials and finishes. Preparation of drawings and specifications. Colour, lighting, furniture, upholstery, art work, plantation. *Prerequisite: ARC 301*

ARC 412 : Landscape Design **3 hrs/week. 2 credits**
Combination of lecture sessions and design work. Lectures on principles of landscape design, elements of landscape design, landscaping with tropical plants. Studio work on site analysis and application of principles and techniques of landscape design. Written reports to support design exercises. *Prerequisite: ARC 301*

COMMUNICATIONS STUDIOS

Graphic Studios:

ARC 111: Graphic Communication I **6 hrs/week. 3 credits**
Mechanical and free hand architectural drawing techniques. Lettering techniques and styles, architectural symbols. Plans, elevations and sections. Single point perspectives, axonometric views.

ARC 112: Graphic Communication II **3 hrs/week. 1.5 credits**
Mechanical and freehand architectural drawing. Free hand sketching of 3D objects, buildings. Two and multi point perspectives. Shade and shadow, reflections. Rendering in black and white and colour. Collage making. Experimenting with various media. *Prerequisite: ARC 111*

Digital Studios:

ARC 113: CAD: Computer Aided Design **3 hrs/week. 1.5 credits**
2 dimensional computer aided drawing. Navigation through the program. Settings. 2D plan, elevation, section, drawing. Rendering. Sign and symbols. Printing. Software: AutoCAD2000. *Prerequisite: ARC 112*

ARC 214: Computer Graphics **3 hrs/week. 1.5 credits**
Introduction to software. Images and colour, resolution, vector and raster. Illustration and formatting, using Corel Draw and Adobe Illustrator. Printing. Scanning. Image editing: using Adobe Photoshop. File Import export. Image manipulation and effects. Software: CorelDraw, Adobe Illustrator, Adobe Photoshop, PageMaker. *Prerequisite: ARC 112*

ARC 315: Digital Visualisation **3 hrs/week. 1.5 credits**
Solid modelling in CAD. Introduction to 3D studio Max software. Animations and walkthroughs. Multimedia applications. Software: AutoCAD, 3D Studio Max, Form Z. *Prerequisite: ARC 214*

Writing Studios:

ARC 511: Seminar I **3 hrs/week. 1.5 credits**
Research and presentation on topics and issues related to art and architecture. Research papers including literature search review and referencing, writing and presentation skills Course offered in part II, part I related to the students current design studio project. *Prerequisite: ENG 203*

ARC 512: Seminar II: (complementing ARC502 or 503) **3hrs/week. 1.5 credits**
Written report to support Thesis or Project work, contents to vary accordingly.

Thesis stream: students to present research on particular project with emphasis on development of programme and conceptual basis supported by a number of case studies to develop formal and structural concepts.

Project stream: students to emphasize functional analysis and detailed analysis of case studies with regard to functional, formal and structural aspects. Justification of chosen solution. *Prerequisite: ARC 511*

Other

ARC413 : Estimation **2 hrs/week. 1.5 credits**
Class exercises on: Determination of cost of construction. Analysis of rates and cost analysis of various items of construction. Preparation schedules. Cost control. Preparation of tender documents, rules, regulations and obligations. Bidding.

LECTURE COURSES

Architecture:

ARC 121: Introduction to Architecture

2 hrs/week. 2 credits

Definitions and meaning of architecture. The objective of architectural education. Architecture and the environment. Design and/in nature. Elements in architecture, point, line, plane, volume and space. Creation and order in space. Principles of spatial organisation scale and proportion. Space and space generation.

History of Art and Architecture:

ARC 122: History of Art and Architecture I

2 hrs/week. 2 credits

Prehistory. Shelter and art in prehistoric times. Art and Architecture of the Indus valley, Mesopotamian, Egyptian and Persian civilizations. Greek architecture and the classical orders. Etruscan architecture. Roman architecture. Chinese and Japanese architecture.

ARC 123: History of Arts and Architecture II

2 hrs/week. 2 credits

European art and architecture. Early Christian, Byzantine, Romanesque, Medieval, Gothic, Renaissance, Baroque and Rococo periods. Early South American Architecture. *Prerequisite: ARC 122*

ARC 224: History of Arts and Architecture III

2 hrs/week. 2 credits

Art and Architecture of the Indian sub-continent. The Vedic, Buddhist and Hindu periods up to the 17th century. *Prerequisite: ARC 123*

ARC 225: History of Arts and Architecture IV

2 hrs/week. 2 credits

Art and Architecture of the Indian sub-continent – the Muslim period. The advent of the Muslims in the 13th century AD till the end of the colonial era. *Prerequisite: ARC 224*

ARC 326: History of Arts and Architecture V

2 hrs/week. 2 credits

Modern art and architecture in the 19th and 20th century. Impressionism to Cubism. Modern architecture: romantic classicism, iron and glass, reinforced concrete. Art Nouveau. The Bauhaus. Modern masters. Development in North American architecture. *Prerequisite: ARC 225*

ARC 327: History of Bengal Arts and Architecture

2 hrs/week 2 credits

Art and architecture of Bengal. Influences. Prehistoric period. Buddhist and Hindu periods. Mauryan, Pala, Sena, Sultanate, Mughal and Colonial periods. Post colonial influences and the emergence of modern architecture in Bangladesh. Louis I Kahn. Influence of the new school of architecture and trends in architectural practice in contemporary times. *Prerequisite: ARC 326*

Planning/ Urban Design:

ARC 231: Concepts in Planning

2 hrs/week. 2 credits

Basic planning theories. History of settlements. City community and regional planning. Physical planning and national development. Planning policies. Planning regulations (building codes).

ARC 232: Urbanism

2 hrs/week. 2 credits

Early cities and their evolution. The rise of the city. Cities in the Developed world. Cities in the developing world and their growth. Urban population dynamics. Implications on economic development, built and natural environment. Tools and techniques of urban planning. Principles of city planning. The global city. Urbanism in Bangladesh.

ARC 331: Urban Design

2 hrs/week. 2 credits

Definition of Urban design, its aims and objectives. Principles of design and applicability in the urban context. Urban aesthetics, grain and texture, urban frame, fabric and function. Perception

and meaning of urban spaces. City planning principles and regulations. Art in the city. Urban design analytic methods and approaches. *Prerequisite: ARC 232*

ARC 431: Rural Architecture

2 hrs/week. 2 credits

Rural settlements in Bangladesh history. Factors influencing settlement patterns. Types of settlements. Traditional house form, variations. Vernacular/rural architecture, social, cultural, economic and technical influences. Artistic expressions in rural architecture. Typological variations. Materials and methods. Construction details. Environmental impact. Use of alternative technologies.

ARC 432: Housing and Development

2 hrs/week. 2 credits

The role and importance of housing in development. Housing as process. Overview of housing problems in developing countries. The housing situation in Bangladesh, policies, reforms and legislation's. Traditional and contemporary housing. Mass housing for low and middle income groups. Housing in the private sector. Rural housing, affordability and sustainability.

Building Sciences/ Services:

ARC 241: Construction I

2 hrs/week. 2 credits

Introduction to construction. Materials and methods. General principles of construction and relationship to design intentions. Basic construction systems. Foundation, floors, wall and roof systems. Modular coordination. Elements in building construction. Doors. Windows, stairs. Services and construction, kitchens and bathrooms.

ARC 242: Construction II

2 hrs/week. 2 credits

Classification of different types of building and finish materials. Preparation, manufacture, properties, uses and application of industrialized and vernacular materials. Appropriateness of application and expression. *Prerequisite: ARC 242*

ARC 343: Technology and Construction

2 hrs/week. 2 credits

Part 1: Advances in technology and application in construction. New materials and methods of construction.

Part 2: Vernacular construction. Traditional methods of construction. Rural construction. Appropriate technology and construction methods. Disaster resistant construction.

Prerequisites: none

ARC 441: Specifications

2 hrs/week. 2 credits

Specifications writing for building construction. Written details to support drawings, outlining the various phases and describing the components for construction. Specifications for materials and installations.

ARC 541 : Professional Practice

2hrs/week. 2 Credits

The role of the architect in the building industry. Duties, responsibilities and obligations of the architect. General conditions of contract, client architect relationship, architectural services. The architect and the public. Building codes and practices. The architect's office. Administration of construction. Conflicts and arbitration. Official correspondence. Professional organisations: local and international.

Environmental Sciences:

ARC 251: Design with Climate

2 hrs/week. 2 credits

Climate and weather. Global climatic factors. The building as a modifier of outdoor climate. Thermal comfort and variables. Thermal balance of buildings. Principles of passive design. Solar design. Ventilation and air flow. Shading. Moisture and rain protection Design strategies. Site planning.

ARC 252: Lighting and Acoustical Design**2 hrs/week. 2 credits**

Part 1: Lighting design. The visual environment. Nature of light and light in designed environments. Human responses to light, daylight in buildings and requirements, prediction tools and techniques. Light as an architectural element. Supplementary and artificial lighting.

Part 2: Concepts in architectural acoustics. Problems of architectural acoustics. Fundamentals of sound perception, generation and propagation. Behaviour of sound in enclosed spaces. Principles of acoustic design in spaces for speech, music and multipurpose use. Noise and noise control. Noise control design. Acoustical measurements and calculations. *Prerequisite: PHY 102*

ARC 452: Design with the Environment**2 hrs/week. 2 credits**

Built form and environment interactions and impacts. Materials and resource use in building construction. Energy consumption in building construction and use, means of optimisation. Alternative energy use. Passive design options. Recycling of building materials and components. Sustainable design. Bioclimatic buildings. *Prerequisites: ARC 251*

Others:**ARC 522: Research Methods****2hrs/week. 2 credits**

Research and its types. Purpose and goals of research. Designing research. Variables and universal. Selection of methods. Data collection; objectives. Data interpretation. Design of questionnaire, pre-test, pilot survey. Data processing. Principles of physical survey. Interpreting survey information.

Civil Engineering:**CEE 211: Structure I****2 hrs/week. 2 credits**

Introduction to structures. History. Structure and architecture. Principles of structural design. Force, equilibrium, free body diagrams, resultants and components, coplanar and concurrent forces, moments and parallel coplanar forces, centroids, moment of inertia of areas, maximum and minimum forces, friction, flexible chords. *Prerequisite: MAT 104*

CEE 212: Structure II**2 hrs/week. 2 credits**

Basic mechanics of solids. Fundamental concepts of stress and strain. Mechanical properties of materials. Stresses and strains in members subject to tension, compression, shear and temperature changes. Joints – welded and riveted. Shear force and bending moment diagrams and implications in design of statically determinate beams and frames. *Prerequisite: CEE 211*

CEE 213: Plumbing Services**2 hrs/week. 2 credits**

Introduction to plumbing. Water requirements. Water sources. Water supply and distribution in buildings. Sewage and sewer systems, building sewer and drainage systems, sewage disposal. Plumbing services and architectural implications. Plumbing services for high rise and specialized building types. Rural sanitation.

CEE 311: Structure III**2 hrs/week. 2credits**

Flexural and shearing stresses in beams. Principal stresses. Direct integration and area moment method for finding slopes and deflections in statically determinate beams. Indeterminate beam analysis. Buckling of columns. *Prerequisite: CEE 212*

CEE 312 : Structure IV**2 hrs/week. 2 credits**

Introduction. Allowable stresses. Different types of trusses and space frames. Wind and static load analysis of trusses. Design of truss sections. Design of steel beams and columns. Timber and bamboo structures. *Prerequisite: CEE 311*

CEE 411: Structure V**2 hrs/week. 2 credits**

Reinforced Concrete. Fundamentals of reinforced concrete design. Working stress design (WSD)

method and ultimate strength design(UDS). WSD design of slabs- one way and two way. Preliminary analysis of flat slabs, flat plates, waffle slabs, ribbed slabs. *Prerequisite: CEE 312*

CEE 412: Structure VI

2 hrs/week. 2 credits

Reinforced concrete columns – stocky and long. Preliminary analysis of column sections in multi-storeyed buildings. Approximate analysis of grids. Approximate analysis of multi-storeyed buildings for gravity and lateral loads. Vierendeel truss. Folded plates. Introduction to shear walls: preliminary design. Introduction and preliminary design of arches, domes and shells. Classification of shells. Prestressed concrete; introduction analysis and preliminary design of beam sections. Earth quake resistant RCC structures. *Prerequisite: CEE 411*

Mechanical Engineering:

MEE 344: Mechanical Services

2 hrs/week. 2 credits

Basic concepts and definitions. Psychometric chart. Cooling load calculations. Types of air conditioning systems. Air handling and distribution. Design of ducts. Air conditioning equipment. Fire hazards, fire fighting methods. Vertical transportation. Types of elevators and escalators. Determination of sizes and types of and elevators. Calculations to determine traffic requirements. Escalators and moving ramps. Architectural implications of mechanical systems. *Prerequisite: PHY 102*

Electrical Engineering:

EEE 345: Electrical Services

2 hrs/week. 2 credits

Power generation. Electrical units and standards. Electrical networks and circuit theorems. Alternating current PLC series and parallel circuits. Introduction to electrical wiring for residential, commercial and industrial use. Load calculations. Illumination and types of lighting. Alternative power generation. *Prerequisite: PHY 102*

PRACTICAL TRAINING

ARC 300: Practical Training

3 credits

This course will have to be taken after the third year of studies or after the completion of 110 credit hours and with a minimum GPA of 2.0. The training will take place in an architectural consulting office approved by the teachers and will consist both training at the office and on site.

A student will be required to spend a semester in an architectural consulting office where he or she will be under the supervision of an architect and will gain experience in assisting the office in the preparation of the design of real projects. He or she will be expected to work on concept drawings, observe and help in the preparation of design documents and spend time on construction sites.

The student will have to provide a report on his or her activities in both parts supported by drawings and photographs and a diary of activities, which will be the basis for evaluation. The supervisor will be required to provide a report on the student's progress (in a prescribed format). *Prerequisite: ARC 402*

ELECTIVE COURSES:

Studio Courses:

ARC 291: Sculpture

2 hrs/week. 2 credits

Sculpture as a form of artistic and architectural expression. Visualizing 3D form. Various techniques in sculpting. Sculpting basic shapes in earth. Free expression through use of plastic material, mixed media: metal, wood, fabric etc.

ARC 292: Painting**2 hrs/week. 2 credits**

Painting as a form of artistic and architectural expression. Introduction to various media in painting. Still life sketches and painting. Study of forms in painting. Landscapes and cityscapes. Colour pencils, crayons, pastels and watercolour. Mixed media. Computers in painting.

ARC 293: Music Appreciation**2 hrs/week. 2 credits**

Musical form. Ingredients of music – sound and time. Indian and western music – melody and harmony. Foundations of sub-continental music: raga system. Presentation of vocal and instrumental music. Modern Bengali music and works of major composers and demonstrations. Western classical music and works of major composers. Music and Architecture, rhythm, composition etc. Music as an inspiration for architecture.

ARC 294: Photography**2 hrs/week. 2 credits**

Introduction to photography as a means for artistic and architectural expression. Photography as an analytic tool for architects. The camera parts of operation and types. Lenses and film. Exposure and settings. Exercises in bracketing and depth of field studies. Photography of buildings. Photo essays.

Lecture Courses:**ARC 391: Rural Housing****2 hrs/week. 2 credits**

The housing problem in rural areas. Factors influencing the housing situation; migration landlessness, land tenure, affordability, sanitation, technology social and cultural factors. Classification of house types. Materials and methods of construction. Innovation in construction and design. Rural housing programmes, governmental and non governmental. Micro credit and rural housing.

ARC 392: Tropical Architecture**2 hrs/week. 2 credits**

The climatic characteristics of tropical areas. Thermal comfort in the tropics. Elements of the natural environment that require consideration in building design: air movement, moisture control, shading, rain penetration. Methods of passive cooling in the tropics. Basic guidelines for design in the tropics. Detailed consideration and overall environmental impact. Extreme conditions: climatic hazards.

ARC 393: Building for Disasters**2 hrs/week. 2 credits**

Disasters – Classification. History of disasters and damage. Buildings and disasters, types of damage. Building design principles to withstand –earthquakes, floods, cyclones, storm surge etc. Post disaster rebuilding.

ARC 394: Contemporary South Asian Architecture**2 hrs/week. 2 credits**

The modern movement in architecture- internationalism and the search for identity. The tradition of south east Asia and the influence of modernism. Attempts to identity-the works of major architects of the region: Kenjo Tange, Kisho Kurokawa, Geoffrey Bawa, Balakrishna Doshi, Charles Correa, Muzharul Islam etc. Regional roots in architecture and the works of contemporary architects: Raj Rewal, Uttam Jain, Tadao Ando, Ken Yeang etc. Prerequisites: ARC326

ARC 491: Architectural Conservation**2 hrs/week. 2 credits**

Conservation, its meaning, nature, scope and principles. Preservation, restoration, reconstruction, adaptation, reuse, area conservation. History of conservation. Conservation laws and practices. Issues in conservation. Regulating bodies and the role of the government and public. Relevance of conservation in the context of Bangladesh.

ARC 492: The City in Development**2 hrs/week. 2 credits**

The contemporary city and its development through the ages. Urban anthropology. The influence of the city on human life. Global development and the city. The problems of the contemporary city

and attempts to solve them. The city in Bangladesh; the current scenario. The culture of the city. Society and the city. Future of the city.

ARC 493: Contemporary Architectural Thought

2 hrs/week. 2 credits

Exploration of theories and concepts in architecture and urban design since the modern movement. The theoretical and methodological issues structuring the production, interpretation and criticism of architecture. Discussion on architecture, information age and global culture.

ARC 494: Ecology and Sustainable Development

2 hrs/week. 2 credits

Definition of sustainable development. Balance between ecology and development. Ecological considerations for the development of the built environment. Resource optimization. Ecological accounting.

ARC 495: Computers in Architecture

2 hrs/week. 2 credits

(to be developed)

Department of English and Humanities

DESCRIPTION OF COURSES

BACHELOR OF ARTS (BA) IN ENGLISH

ENG 091: Foundation Course in English

The English Foundation Course is designed to enable students to develop their competence in reading, writing, speaking, listening and grammar for academic purposes. The students will be encouraged to acquire skills and strategies for using language appropriately and effectively in various situations. The approach at all times will be communicative and interactive involving individual, pair and group work.

ENG 101: Fundamentals of English

3 credits

Drills in basic writing skills: mechanics, spelling, syntax, usage, grammar review, sentence and essay writing. Required of all First Year students.

ENG 102: Composition I

3 credits

The main focus of this course is writing. This course attempts to enhance students' writing abilities through diverse writing skills and techniques. Students will be introduced to two aspects of expository writing: personalized/subjective and analytical/persuasive. In the first category, students will write essays expressing their subjective viewpoints. In the second category, students will analyse issues objectively, sticking firmly to factual details. This course seeks to develop students' analytical abilities so that they are able to produce works that are critical and thought provoking

ENG 106: Fundamentals of English

2 credits

The course is meant for 1st semester students of Architecture. The main objectives of this course include: Developing effective and efficient reading, writing, listening and speaking strategies and techniques, increasing students' repertoire of vocabulary, reading with speed and understanding, writing standard, well: informed academic essays, enhancing spoken fluency.

ENG 111: Principles of Linguistics

3 credits

The course aims to familiarize students with basic concepts in linguistics including phonetics; phonology; morphology, syntax and semantics. Other aspects of this course will include definition and characteristics of language; role of linguistics in language teaching, relationship between linguistics and literature; second language acquisition and second language learning

ENG 113: Introduction to English Poetry

3 credits

Study of selected English poems from Shakespeare to contemporary times; Analysis of Poems; Prosody; Poetic Genres.

ENG 114: Introduction to English Drama

3 credits

Study of selected plays from Shakespeare to Pinter; Analysis of Drama; Poetics and Fundamentals of Drama; Dramatic Forms.

ENG 115: Introduction to English Prose

3 credits

Study of selected English Fictional and Non-Fictional Prose from Swift to contemporary times; Analysing Prose, Prose Forms.

ENG 122: English Phonetics and Phonology

3 credits

This course is designed to promote a comprehensive study of English articulatory phonetics that deals with the production of English speech sounds. It intends to develop students' skills in perceiving, articulating and transcribing speech sounds. It also focuses on segments, syllables, stress, intonation and functions of intonation that are segmental and supra-segmental features. On the one hand, the practical aim of this course is to help students

pronounce English accurately and on the other hand, its theoretical aim is to give students a deeper understanding of the sound system of English. Besides, this course covers a comparative study of Bangla and English phonetics. *Prerequisite: ENG 111.*

ENG 123: History of English Language

3 credits

This course will familiarize students with the evolution and development of English Language; its current practices, and forces responsible for giving it the shape it is in.

ENG 201: Composition II

3 credits

A workshop on practical writing focusing on principles and style; practice in correct and effective expression and in organization and writing. *Prerequisite: ENG 102*

ENG 202: Business English

3 credits

This course is aimed at developing students' verbal and written communication skills with regard to business and commercial purposes. International correspondence, brochures, press releases and reports are important components of this course. The course will also enable students to participate in business discussions and negotiations with proficiency. *Prerequisite: ENG 102*

ENG 203: Communication skills for Architecture

1.5 credits

This course is designed to strengthen Architecture students' communication skills that they need to perform successfully in academic and non-academic fields. It will be a laboratory-based course. Audio visual aids in the laboratory will facilitate speaking as well as listening accuracy. In this course, students will participate in discussions, give oral presentations, learn pronunciation skills and practice language functions. A good number of listening activities will be included to help students enhance their note-taking and comprehension skills

ENG 204: Technical Writing

3 credits

This course concentrates on the principles and practices of writing to communicate scientific and technical information to a variety of readers, including scientific and technical readers. This course may also be offered to people working at managerial levels and the general public. This course also deals with grammatical structures and stylistic strategies within specific professional contexts. Achieving clarity and conciseness through word choice and placement, using a variety of sentence structures for appropriate emphasis, handling details and establishing effective tone are some of the goals this course will seek to attain. *Prerequisite: ENG 102.*

ENG 211: Sociolinguistics

3 credits

This course is the study of language as a social factor. The study takes into account regional and social dialects along with standard language, the process of standardization and pidgin and Creole languages. It also focuses on how language functions in society and deals with bilingualism, multilingualism, diglossia, code switching, register, and style. Besides, the course intends to give students an overview of the relationship between language and social class, and language and gender. *Prerequisite: ENG 111*

ENG 212: Psycholinguistics

3 credits

This course examines stage by stage acquisition of phonology, morphology, syntax and semantics of the child's first language. In other words, it aims to provide students with the knowledge of the earliest stages of a child language acquisition; development of the child's sound system i.e. how children perceive and produce the sounds of their language; the acquisition of language structure emphasizing the principles children apply in this regard and the acquisition of meaning along with their awareness of the form and function of speech acts. The course also covers major L1 theories that include behaviourist, innatist, maturation and cognitive theories. Students are required to undertake a project based on naturalistic observation to study children's early language acquisition processes. *Prerequisite: ENG 111*

ENG 213: Survey of English Literature I**3 credits**

Chaucer to Donne: Intensive Study of Chaucer, Spencer, Marlowe, Shakespeare, Webster, Jonson, Bacon, John Donne.

ENG 214: Survey of English Literature II**3 credits**

Milton to Johnson: Intensive Study of Milton, Dryden, Swift, Defoe, Pope, Fielding and Dr. Johnson.

ENG 215: Survey of English Literature III**3 credits**

Blake to Hardy: Intensive Study of Blake, Wordsworth, Jane Austen, Coleridge, Shelley, Keats, Byron, Dickens, Charlotte Bronte, Tennyson, Browning, Arnold and Hardy.

ENG 217: Shakespeare**3 credits**

An introduction to the plays of Shakespeare (history, comedy, tragedy, and romance). The plays will be studied in the context of Renaissance thought and will explore issues such as politics, religion, family, gender, historical settings and theatrical performances.

ENG 218: Post-Colonial Writing in English**3 credits**

This course will look at the vast body of contemporary writing in English from ex-colonial countries. Possible authors are Salman Rushdie, Ngugi 'wa Thiong'o, Amitav Ghosh, Chinua Achebe, Derek Walcott. The international status of English in today's world will be examined through these readings, and the changed but continuing significance of English studies highlighted.

ENG 221: Discourse Analysis**3 credits**

This course explores the structure and social context of texts both written and spoken language. Attention is focused on the structure and function of language beyond the sentence i.e. the way in which spoken (discourse) and written language (text) is used in coherent and meaningful ways (pragmatics). The course will therefore include issues like: functions of language; analysis of spoken and written language; rules and procedures in discourse analysis; role of context in interpretation of discourse; cohesion and coherence; speech acts, the cooperative principles and conversation analysis. Students will be engaged in classroom discourse analysis by developing and implementing discourse research projects. *Prerequisite: ENG 111*

ENG 232: History of English Language Teaching**3 credits**

This course is designed to review the history of English language teaching. It covers the spread of English language teaching in Europe, and gives an overview of English language teaching since 1900 and the teaching of English as a foreign or second language since 1900, including foundations, development, changes and variations that took place in ELT.

ENG 240: Restoration and Early Eighteenth-Century Literature**3 credits**

The course will focus on the rise of new literary genres and the contemporary efforts to find new definitions of heroism and wit, good taste and good manners, sin and salvation, individual identity and social responsibility, and the pressures exerted by changing social, intellectual, and political contexts of literature. Readings from Dryden, the Restoration dramatists, a few early feminist writers, Defoe, Swift, and Pope.

ENG 241: Later Eighteenth-Century Literature**3 credits**

A selection from works by Johnson, Boswell and Sterne, together with shorter samplings from Gray, Burke, Goldsmith, Burney, Reynolds, Wollstonecraft, and others

ENG 242: The Study of English**3 credits**

Orientation to the study of English language and literature and to the sources and methods of research in English.

ENG 247: Eighteenth-Century English Novel**3 credits**

A study of selected 18th century English novels read in the context of both contemporary and current novel criticism. Novels by Edgeworth, Burney, Defoe, Smollett, Fielding, Sterne, Richardson, and Austen.

ENG 257: Victorian Poetry**3 credits**

Victorian poetry is marked not only by experimentation in style, but also by the portrayal of the doubts and conflicts of the day. This is represented by a group of poets, who while having very little in common with each other, nevertheless hold up for the reader of the period, the main intellectual and spiritual tensions that marked nineteenth-century England. This course will take the students through the poetry of Tennyson, Robert and Elizabeth Barrett Browning, Arnold, Swinburne, Dante Gabriel and Christina Rossetti and Hopkins. Both poetic experimentation and style and themes and conflicts will be the focus of this course.

ENG 260: Nineteenth-Century Women Novelists of England**3 credits**

The nineteenth century is not only the great age of the English novel, it is also the era in which women appeared as major writers of the novel. This course will take the students through the works of the major women novelists of the nineteenth century: Mary Shelley, Jane Austen, Charlotte and Emily Bronte, George Eliot and Elizabeth Gaskell. The course will highlight the wide variety of themes and styles that these writers represent ranging from the Gothic to social realism.

ENG 262: The Urban Novel**3 credits**

The representation of the city in novels from several literatures will be the focus of this course. The course explores such topics as the semiotics of the city, the "painting of modern life," the commodity culture of cities, politics and anarchy, plots and urban detection, the city and the construction of identity, transgression in gender and class, the poetics of the city and the tensions between modernism and postmodernism. Readings will begin with Dickens' *Bleak House* and conclude with Calvino's *Invisible Cities*.

ENG 266: The English Text in the Indian / Colonial Classroom**3 credits**

This course will trace the history of English studies in the Indian subcontinent. Starting with Macaulay's 1835 'Minutes on Education', it will look at the purpose of the colonial English curriculum. Macaulay's 'Minutes' will be read in conjunction with 'native' (Indian or Bengali responses) to the English educational scheme, reflected in thinkers such as Vidyasagar ('Notes on the Sanskrit College' [in English]) and the contemporary educational reformers and literature.

ENG 301: Research Methodology**3 credits**

This course provides practical training in a range of research skills and methodologies. It includes classes on the choice and organization of thesis / research topics, the use of library resources, the Internet, the use of manuscripts and archives, media audiences and institutions, concepts of textuality, and the writing, documentation, and presentation of research articles / theses. This course also introduces qualitative and quantitative methods in research. In this regard, strategies for planning and carrying out various types of research will also be discussed and applied. *Prerequisite: ENG 201*

ENG 319: Modernism**3 credits**

Modern literature in its relationship to earlier literary and intellectual traditions, principal themes, and technical achievements, seen through the study of such writers as James, Conrad, Lawrence, Joyce, Yeats, Williams, Woolf, Stevens, Pound, Eliot.

ENG 327: Second Language Acquisition (SLA)**3 credits**

This course has been designed to provide students with knowledge of SLA. There are two segments in this course: issues and theoretical perspectives, and research. The first segment

includes the key issues in SLA: the roles of L1, input, interaction and formal instruction in SLA, and learners' strategies. Besides, this course focuses on individual differences in SLA i.e. age, intelligence, attitude, motivation, memory etc. In the second segment of the course students are required to undertake a project on any issues related to SLA. This course also gives an overview of the major theories of SLA that include acculturation, accommodation, monitor-model, interlanguage and universal theories. *Prerequisite: ENG 111.*

ENG 328: Advanced Grammar

3 credits

This course provides an overview of English grammar from a descriptive point of view. It is designed to show students how descriptive grammar differs from prescriptive grammar. With a view to clarifying incompatibility between traditional grammar and modern grammar, the course facilitates an intensive study of word, word classes, morphology, modality, functions of clauses and meaning of grammatical categories that include tense, aspect, gender, number and person. It also focuses on systems of syntactic analysis that contain IC analysis, phrase-structure grammar and transformational generative grammar. *Prerequisite: ENG 111*

ENG 331: Cultural Studies: Theory And Practice

3 credits

This course will consist of an examination of cultural and literary theories, looking at the relations between society and literary and cultural production. Besides introducing students to the core concepts in cultural theory, the course will also equip them with the skills to analyse and understand the processes of cultural production in our own society. Issues such as popular culture and cultural politics, including feminist and post-colonial perspectives will be highlighted in the course.

ENG 332: Teaching Techniques

3 credits

This course seeks to familiarize students with teaching techniques i.e. drill, role-play, group work and their purposes. It helps students apply those techniques in teaching language skills that include writing, reading, speaking, listening, grammar, vocabulary, pronunciation and other micro skills which contain guessing word meaning, interpreting graphs and summarizing, note-taking. This course also covers error analysis, usage of L1 and L2, usage of authentic materials and incorporates observation of classroom teaching techniques.

ENG 333: Globalisation and The Media

3 credits

This course will include an introduction to post-modern and globalisation theories, as well as theories of consumer culture. Its main focus will be to study audio-visual media, as well as other forms of cultural production that lend to the creation of global public opinion and the creation of a global culture. The growth of a global culture and its interactions with local and regional cultures will form a key focus of the course.

ENG 334: ELT Methodology

3 credits

This course is an analytical study of approaches and methods in language teaching that include grammar translation method, audio lingual method, natural approach, communicative language teaching. It enhances students' understanding of the principles on which these methods are based. Its aim is to familiarize students with the currently available alternatives, which are based on earlier and more recent theories and practices. Students are required to be engaged in observation and evaluation of teaching methods used in ELT classes.

ENG 335: Linguistic Theories

3 credits

In this course various linguistic theories (such as Saussure, the Descriptivists, the Sapir-Whorf hypothesis, Noam Chomsky, and Generative Grammar) will be discussed. The idea is to chart the conceptual ground on which language as a medium of communication today stands.

ENG 343: Classical Literary Theory

3 credits

Intensive Study of Classical Texts of Literary Theory by Aristotle, Sydney, Dryden, Johnson, Wordsworth, Coleridge, Arnold, Eliot.

ENG 354: Survey of American Literature I **3 credits**

Bradstreet to Whitman: Intensive Study of Texts by Bradstreet, Taylor, Franklin, Poe, Hawthorne, Melville, Emerson, Thoreau and Whitman.

ENG 355: Survey of American Literature II **3 credits**

Dickinson to Toni Morrison: Intensive Study of Texts by Dickinson, Twain, Chopin, O'Neill, Frost, Hemingway, Fitzgerald, Miller, Lowell, Bellow.

ENG 357: Survey of World Literature in Translation I **3 credits**

Intensive Study of Texts by Homer, Aristophanes, Sophocles, Euripides, Virgil, Ovid and Kalidas.

ENG 358: Survey of World Literature in Translation II **3 credits**

Intensive Study of Texts by Machiavelli, Moliere, Rousseau, Goethe, Balzac, Dostoevsky, Tolstoy, Ibsen, Baudelaire, Brecht, Kafka and Tagore.

ENG 359: Advanced Study of Shakespeare **3 credits**

Topics vary from year to year; the course supposes significant prior experience of Shakespearean drama and/or non-Shakespeare Renaissance drama. *Prerequisite: ENG 217*

ENG 360: Romanticism: Crisis and Critique **3 credits**

An exploration of the dialogue between literature and philosophy and an examination of the role of language in engendering the ideas of genius, originality, self-authoring and poetic identity. Topics include Romantic irony, allegory, the sublime, the uncanny, Romantic fragments in opposition to philosophical systems, dreams, and mythmaking. Texts from the Romantic period as well as interpretations by modern writers are read. Authors include Wordsworth, Coleridge, Keats, Shelley, Mary Shelley, Herder, Schiller, Kant, Schlegel, Kleist, Holderlin, Derrida, Rousseau, de Man and Benjamin. *Prerequisite: ENG 215*

ENG 362: The English Text in the Bengali / Colonial Classroom **3 credits**

This course will look at English writings in Bengal in the nineteenth century and writers such as Derozio, Madhusudan, Bankim, Toru Dutt and so on. This reading will be offset with readings from the English romantic poets and the early Victorian novels, not only to trace influences, but also to look at the cultural and literary impact of the colonial venture on our own writings and imagination. *Prerequisite: ENG 266*

ENG 364: Theories of Fiction **3 credits**

A study of narrative structure and rhetoric, focusing on the models presented in structuralism and post-structuralism, psychoanalysis, and cultural critique. Authors include: the Russian formalists, Hillis Miller, Foucault, Todorov, Barthes, Derrida, Freud, Lacan, Lukacs, Bakhtin, Benjamin, Jameson.

ENG 366: Major Texts of the Feminist Tradition in the West **3 credits**

From Wollstonecraft to Woolf: A study of works from the mid-seventeenth century to the late 1930's, which examine the causes of nature of women's places in society and the creation of alternative visions and strategies. Includes authors such as Mary Wollstonecraft, Mary Shelley, Margaret Fuller, Elizabeth Cady Stanton, Sojourner Truth, Harriett Beecher Stowe, Charlotte Perkins Gilman, Radclyffe Hall, Zora Neale Hurston, and Virginia Woolf.

ENG 367: English Writing and British Colonialism **3 credits**

This course will concentrate on the early twentieth century and the ways in which the colonial experience is reflected in literary and creative writing. The writings of the emerging anti-colonial movements of the period will be read in conjunction with "imperial" texts. A possible reading list will include writings by E. M. Forster, Joseph Conrad, Edward Thompson, Jawaharlal Nehru, Rabindranath Tagore, C. L. R. James and so on.

ENG 368: Milton**3 credits**

A survey of a broad array of Milton's writings in poetry and prose, with particular emphasis not only upon his individual accomplishments, but also upon contemporary discussions of who "the poet" is and by what standards the accomplishments of poetry should be measured.

ENG 401: Editing**3 credits**

The editor's role; reading proofs; the production process; marking the typescript; structure and headings; spelling and vocabulary; grammar; meaning and clarity; punctuation; capitals and hyphen; dialogue and extracts; perspective and level; the author's voice; consistency and house style; numbers and math; use of italics; styling in bibliographies; notes and short title references; author-date references; making cuts; tables; lists; design and layouts; illustrations; preparing the index; permission and libels; preparing the preliminary pages and jacket blurbs.

ENG 404: Copywriting**3 credits**

Principles of Copywriting: preparing copy for print media; copywriting for radio, television and films; copywriting for social marketing; preparing texts for brochures; designing campaigns; working with graphics and layouts.

ENG 414: Twentieth-Century English Literature**3 credits**

This will be a survey course, divided into different periods, such as: early, middle and late twentieth century, to enable the students to make their way through the very rich and complex terrain marked out by the authors of these periods. From the early twentieth century period we will look at the plays of George Bernard Shaw, the novels of Joseph Conrad, E.M.Forster, Virginia Woolf, James Joyce, D.H. Lawrence, Katherine Mansfield and George Orwell. T.S.Eliot, W.B.Yeats, Ezra Pound, W.H.Auden and Wilfred Owen will represent the poets of this era. Middle and late twentieth century literature will include authors like Samuel Beckett and Harold Pinter for their plays, and Doris Lessing, Nadine Gordimer, V.S. Naipaul, and Edna O'Brien for their prose writings. The poetry of Philip Larkin, Dylan Thomas, Ted Hughes, Derek Walcott and Seamus Heaney will represent this period.

ENG 434: Materials Design**3 credits**

The objective of this course is to familiarize students with theories and principles of materials design. It includes planning, developing, piloting, assessing and redesigning materials. Besides, the course focuses on the problems faced by materials designers. In this course students are required to design materials for different levels of language teaching.

ENG 437: Testing and Evaluation**3 credits**

This course is a review of issues in language testing and evaluation. It is designed to introduce students to underlying principles of testing and evaluation. It focuses on different types of testing, their goals and techniques of evaluating basic language skills i.e. reading, writing, speaking and listening. In addition, through this course students acquire skills in developing and critiquing classroom test materials.

ENG 438: Syllabus Design**3 credits**

This course is designed to study the background of language syllabus design; various types of syllabi; needs analysis and the problems faced by syllabus designers. It also investigates the decision-making process that involves planning, developing, implementing, evaluating and modifying syllabi. Besides, students are required to write a report on the evaluation of syllabi used in ELT classes or to design a syllabus for SSC/HSC level of ELT.

ENG 439: Teaching Practicum**3 credits**

This course seeks to develop students as effective ESL/EFL teachers by providing them with knowledge and awareness of the learning environment. It emphasizes observational skills, insights into effective lesson planning and helpful techniques to manage the language

classroom. In this course students are engaged in observation and micro teaching practice in ESL/EFL classes.

ENG 440: English for the Print Media

3 credits

This course will provide students with the English Language skills necessary to work or write for newspapers, journals and other print media. The course will give them an understanding of how a newspaper or journal is organized and introduce them to the different aspects of journalistic writing. The course content will include news reporting, feature writing, literary-critical analysis, news commentary, op-eds and post-editorials, planning a story, including cross-checking and editing.

ENG 456: Marginality and Transgression in Victorian Literature

3 credits

A re-reading of Victorian texts with the aim of foregrounding concerns that High Victorianism tried to suppress or marginalize: poverty, sexuality, revolution, criminality, and aestheticism. The course will look at the ways in which the anarchic and scandalous jostling against the "respectable" affect both the forms and themes of Victorian literature. The semiotics of transgression, the discourses of sexuality, the fascination of the other, the connections of the upper classes with the underworld: these are some of the issues to be explored.

ENG 458: Women of Talents

3 credits

Identification and definition of "female aesthetics" and associated ethics. Issues include: why/where/how women write; how women writers represent acts of imagination, its processes, practices, and psychology; how women novelists assume or question the existence of a "female tradition"; how the resistance of female aesthetic to closure, to "forms" and "framing", both conforms to and challenges post:modernist thought; how women writers' "special relationship to language" problematizes the function and status of figurative language; how the body and the "literal" inform 'female' discourse; and how a theory of a special kind of "embodiment" or "incarnation" of the word comes to factor importantly in articulations of such an aesthetic. Readings from novels by Cisneros, Drabble, Kingston, Kincaid, Lessing, Morrison, Woolf, short-stories by multi-cultural writers in English, essays about writing by women and appropriate theory will form part of this course.

ENG 460: Moderns and Contemporaries

3 credits

A study of the moment of divergence in high culture which occurred around 1900, and which is marked in literature by the disagreement between "contemporaries", who appealed to the main body of cultured taste by continuing the novelistic tradition of realism, and the "moderns", who rejected realism in the name of art. Moderns include such writers as James, Woolf, Lawrence and Conrad; contemporaries include John Galsworthy, H. G. Wells, Arnold Bennett, and Rudyard Kipling.

ENG 461: Modern British Drama

3 credits

Readings from Wilde, Shaw, Beckett, Pinter, Stoppard, Orton and Churchill.

ENG 462: Post-Colonial Literary Theory

3 credits

Based on a reading of Edward Said's *Orientalism* (1978) students will have to read relevant works by Michel Foucault, Antonio Gramsci and Jacques Derrida. Contemporary developments in post-colonial theory, including the works of Gayatri Spivak, Homi Bhabha and Aijaz Ahmad will form an intrinsic part of this course.

ENG 464: Post-Colonial Literature

3 credits

Intensive Study of Texts by Nirad Chaudhuri, Narayan, Achebe, Garcia Marquez, Soyinka, Walcott, Rushdie, Gordimer, Desai.

ENG 465: Translation Studies

3 credits

Theory and practice of translation. Problems of translation from Bangla to English and vice versa.

ENG 466: Dissertation**6 credits**

Students will write a dissertation in consultation with a supervisor on any area in their specialized stream. At the end of the semester students will be required to make a satisfactory presentation to a board of examiners. For students taking options B or C, this can be a semester-long internship, followed by a report, which must be acceptable to a board of examiners.

ENG 490: Seminar Course**3 credits**

This course is offered to students in the senior year. Special courses will be offered either by a senior full-time member of the faculty or by visiting faculty on a special topic. The course will consist of 3-hour long extensive seminars on various sub-topics each week. This course requires intensive study and a close working relationship between student and teacher.

HUM 101: World Civilization and Culture**3 credits**

A brief view of the major civilizations and cultural aspects in different continents covering ancient, medieval and modern civilizations. Topics include the Renaissance, the Reformation, the beginning of the modern world, the scientific revolution, the industrial revolution, the age of democratic revolutions, nineteenth century Europe, the Asia-Pacific Region, Africa, the World Wars, South Asia (colonization, decolonization and after) and the contemporary world (the Cold War and after).

HUM 103: Ethics and Culture**3 credits**

This course introduces the students to principles and concepts of ethics and their application to our personal life. It establishes a basic understanding of social responsibility, relationship with social and cultural aspects, and eventually requires each student to develop a framework for making ethical decisions in his work. Students learn a systematic approach to moral reasoning. It focuses on problems associated with moral conflicts, justice, the relationship between rightness and goodness, objective vs. subjective, moral judgment, moral truth and relativism. It also examines personal ethical perspectives as well as social cultural norms and values in relation to their use in our society. Topics include: truth telling and fairness, objectivity vs. subjectivity, privacy, confidentiality, bias, economic pressures and social responsibility, controversial and morally offensive content, exploitation, manipulation, special considerations (i.e. juveniles, courts) and professional and ethical work issues and decisions. On completion of the course, students will be able to identify and discuss professional and ethical concerns, use moral reasoning skills to examine, analyze and resolve ethical dilemmas and distinguish differences and similarities among legal, ethical and moral perspectives.

Economics and Social Sciences

DESCRIPTIONS OF COURSES

BACHELOR OF SOCIAL SCIENCE (BSS) IN ECONOMICS

ECONOMICS COURSES

Core Courses

ECO 101: Introduction to Microeconomics

3 Credits

Objectives: This is the first course in Microeconomics for the students of Economics major. This course is also required for BBA major students as an introduction to Microeconomics. The aim of the course is to provide a non-technical introduction to the basic microeconomic theory.

Topics: Basic concepts in Economics; Absolute and Comparative advantage, Gains from Specialization and Trade; Supply and Demand Analysis; Consumer Choice; Production and Cost Analysis; Theories of the Firm: perfect competition, monopoly, monopolistic competition, oligopoly; Theory of Distribution and Welfare Economics; Government Intervention and Policies.

Prerequisite: MAT 101

ECO 102: Introduction to Macroeconomics

3 Credits

Objectives: This is the first course in Macroeconomics for the students of Economics major. This course is also required for BBA major students as an introduction to Macroeconomics. The aim of the course is to provide a non-technical introduction to the basic macroeconomic theory.

Topics: National Income Accounting; Growth, Unemployment and Inflation; Determination of Income and Output; Money Market and Interest Rate; Role of Government, Monetary and Fiscal Policies; International Macroeconomic Issues. *Prerequisite: ECO 101*

ECO 104: Principles of Economics (for students of ARC)

2 credits

Concepts of micro and macro economics. Supply and demand. National Income accounting. Development indicators, comparison and validity. Role of government and private sector in development. Economic policies and impact on development. The private sector in development. International economic issues. *Prerequisites: None*

ECO 105: Fundamentals of Economics (for students of EEE)

3 credits

Fundamental concepts in microeconomics and macroeconomics. Basic elements of consumer choice, demand and supply, product ion and cost , market structure. National income accounting, growth, unemployment and inflation, money and interest rate. Fiscal policy and monetary policy, economic growth and development. comparative advantage, foreign exchange and balance of payments, globalization. *Prerequisites: None*

ECO 201: Mathematics for Business and Economics

3 Credits

Objectives: The objective of this course is to provide an introduction to mathematical tools and techniques that are frequently used in microeconomics, macroeconomics, finance, and operations.

Topics: Introduction to Business and Economic models; Sets and Functions; Linear models, Matrix operations and Systems of linear equations; Mathematics of Finance; Differentiation and Applications; Introduction to Unconstrained and Constrained Optimization; Introduction to Linear Programming: Graphical Approach. *Prerequisites: MAT 101, ECO 101*

ECO 202: Statistical Methods for Business and Economics

3 Credits

Objectives: The objective of this course is to provide an introduction to statistical methods and

their applications in economics and business. The course also introduces statistical software packages for practical applications.

Topics: Probability and Mathematical Expectation; Probability Distributions: Binomial, Poisson and Normal Distributions; Sampling Theory; Statistical Inference and Hypothesis Testing; Regression and Correlation Analysis; Non-parametric Tests; Introduction to Decision Theory. *Prerequisites: MAT 101, STA 101*

ECO 203: Intermediate Microeconomics

3 Credits

Objectives: This is the second course in microeconomic theory for students of the economics major. The course aims to provide a thorough understanding of the basic microeconomic theory developed in ECO 101 at a more rigorous level.

Topics: Theory of Consumer Choice; Theory of Production and Cost; Market Structures and

Pricing: Monopoly, Oligopoly and Perfect Competition; Factor Markets; General Equilibrium and Welfare; Introduction to Game Theory; Economics of Information. *Prerequisites: ECO 101, ECO 201*

ECO 204: Intermediate Macroeconomics

3 Credits

Objectives: This is the second course in macroeconomic theory for the students of the economics major. The course aims to provide a thorough understanding of the basic macroeconomic theory developed in ECO 102 at a more rigorous level. The course also introduces basic models of macroeconomics.

Topics: Output and Interest Rate Determination in IS-LM Model; Labour Market, Supply-Side Economics and AD-AS Model; Long-run Economic Growth; Introduction to Rational Expectations; Introduction to Open Economy Models; Monetary and Fiscal Policies under Different Frameworks. *Prerequisites: ECO 102, ECO 201*

ECO 303: Introduction to Econometrics

3 Credits

Objectives: The objective of this course is to equip the students with basic econometric tools for economic data analysis. Students are required to do a small empirical research project using econometric software packages.

Topics: Review of Expectations, Probability Distributions, Sampling and Hypothesis Testing; OLS regression analysis: Two-Variable and Multiple Regression; Inference, Hypothesis Testing and Forecasting; General Linear Models and Dummy Variables; Multicollinearity, Heteroscedasticity and Serial Correlation; Specification Errors and Instrumental Variables; Introduction to Limited Dependent Variable Models. *Prerequisites: ECO 201, ECO 202*

ECO 308: International Trade

3 Credits

Objective: This course provides an introduction to international trade theories and policies.

Topics: Theories of absolute and comparative advantages; Heckscher-Ohlin and Factor Price Equalization Theorems; Offer Curves and Gains from Trade; Economies of Scale and New International Trade Theories; Industrial-Organization based trade models; The theory of protection; Export promotion & import substitution policies; Custom Unions, Regional co-operation, WTO. *Prerequisite: ECO 203, ECO 204*

ECO 309: Public Finance

3 Credits

Objectives: This course provides a survey of the analysis of government expenditure and taxation policies in an economy.

Topics: Review of Welfare theorems, Efficiency and Equity; Analysis of Public Goods; Theory of Externalities and Corrective Taxes; Social Insurance Programs such as Social Security; Theory of

Taxation, Tax Incidence and Optimal Taxation; Tax policy and expenditure policy analysis of fiscal system in Bangladesh; Expenditure and revenue policies and incidence of expenditure.
Prerequisites: ECO 203, ECO 204

ECO 310: History of Economic Thought

3 Credits

Objectives: This course provides an introduction to the history of economic thought.

Topics: Birth of political economy; Mercantilism and Classical economics: Smith, Malthus, Ricardo, Mill; Socialist thought and Marx; Marshall and the Marginal Revolution; Keynes and the Keynesian revolution; Neoclassical synthesis and economic growth; Theory of general equilibrium and welfare economics; Value, distribution and role of the state. *Prerequisite: ECO 101, ECO 102*

ECO 311: Economic Growth and Development

3 Credits

Objectives: This course provides an introduction to Micro and Macroeconomic theories of economic growth and their development aspects.

Topics: Nature of underdevelopment; Alternative growth theories; Dualism; Population, Human Capital and Development; Agriculture and development; Development and the environment; MNCs, FDI, Foreign assistance and debt. *Prerequisites: ECO 203, ECO 204*

ECO 312: Cost Benefit Analysis

3 Credits

Objectives: The main objective of this course is to analyze project choice, institutional framework, and cost & benefit analysis for project evaluation. It also covers measuring the profitability of a project under different goals-framework of project proposal, logical framework analysis, project monitoring.

Topics: Measuring consumer and producer surplus; Economic concepts of cost and benefits; Investment criteria and discount rate; Financial internal rate of return, economic internal rate of return; Shadow prices and Social discount rate; Introducing risk and uncertainty; Valuation of nonmarket costs and benefits. *Prerequisites: ECO 203, ECO 204*

ECO 313: Environmental and Resource Economics

3 Credits

Objectives: This course introduces the key problems in natural resource and environmental economics.

Topics: Economic, cultural, social, and political aspects of human population dynamics; Food resources, food security and hunger; Mineral and energy resources; Wilderness and wildlife resources; Air, land and water pollution; Toxic waste management from environmental and conservation viewpoints. *Prerequisites: ECO 203, ECO 204*

ECO 324: Bangladesh Economy

3 Credits

Objectives: This course analyzes the economic features and macroeconomic performance of the economy of Bangladesh.

Topics: Sectoral development and analysis of sectors in a general equilibrium framework; Agriculture, industry, service sectors in Bangladesh; Foreign trade and foreign aid; Financial institutions and monetary management and fiscal policy; Technology and human resource development; Role of NGOs; Long term performance of Bangladesh. *Prerequisites: ECO 203, ECO 204*

ECO 431: International Finance and Economic Policy

3 Credits

Objectives: The course provides an introduction to international monetary and financial system.

Topics: Balance of payments, economics and accounting; Partial and General equilibrium models of exchange rate determination; Interest rate parity and purchasing power parity theory; Role of monetary and fiscal stabilization policies in open economies; International debt problems; Role of

international financial institutions in developed and developing economies. *Prerequisites: ECO 203, ECO 204*

ECO 432: Money and Banking

3 Credits

Objectives: This course provides an introduction to the monetary and financial structure of the economy and the operation of the banking sector.

Topics: Role of money in the economy and its impact on output, employment, and prices; Types of financial assets and their uses, stock and bond markets; Money and credit multipliers; Banking system of Bangladesh; Various monetary policies and their effectiveness; Central banking, credibility, rules, discretion. *Prerequisites: ECO 203, ECO 204*

Elective Courses

Along with the core courses in Economics, the students are encouraged to take Economics elective courses in various other fields of economics like international economics, development economics, public economics, monetary and financial economics, environmental economics etc, for further understanding of the subject. These elective courses are broadly divided into the following areas in economics: Microeconomics, Macroeconomics, Quantitative Methods, International Economics, Monetary and Financial Economics, Public Economics, Agriculture, Resource and Environmental Economics, Development Economics and Economic Growth and other special topics.

ECO 205: Mathematics for Economics II

3 Credits

Objectives: Development of higher-level mathematical applications in economics.

Topics: Introductory Linear Algebra-Matrices, Eigenvalues, Vector Spaces; Comparative Static analysis and applications; Non-Linear Programming: Optimization with inequality constraints; Integration, Differential equations and their application to economics; Introduction to Dynamic programming. *Prerequisites: ECO 201, ECO 203*

ECO 301: Microeconomic Analysis

3 Credits

Objectives: The objective of this course is to provide an advanced treatment of standard microeconomic theories. The course is aimed at students who are planning to pursue graduate studies in economics.

Topics: Review of Linear Algebra and Optimization Theory; Technology and Production, Profit and Cost Function, Duality in Production; Consumer Choice, Duality in Consumption, Measurement of Welfare; Competitive Markets and Introduction to General Equilibrium; Information Economics and Applications. *Prerequisites: ECO 203, ECO 205*

ECO 302: Macroeconomic Analysis

3 Credits

Objectives: The objective of this course is to provide an advanced treatment of standard macroeconomic theories. The course is aimed for students who are planning to pursue graduate studies in economics.

Topics: Review of dynamic programming models; Growth Theories without technological progress; Technological progress and new growth theories; Introduction to business cycle models; Expectation and information models; New Keynesian models of imperfect competition. *Prerequisites: ECO 204, ECO 205*

ECO 304: Agricultural Economics

3 Credits

Objectives: The course provides a survey of key problems in agricultural economics.

Topics: Introduction of agriculture as an industry; Economics of agricultural production, farm management; Land economics, rural organization; Agricultural credit and finance; Agricultural marketing; Agricultural law, agrarian reform and agricultural policies; Agricultural prices and government policy. *Prerequisites: ECO 203, ECO 204*

ECO 305: Labour Economics**3 Credits**

Objectives: The main objective of the course is to provide a survey of key issues in contemporary labour economics.

Topics: Theory of labour demand and supply; Neoclassical theories of wage and employment; Labour market structure; Government intervention and minimum wage laws; Effect of social insurance and welfare programs; Labour unions and collective bargaining; Turnover and Search theories; Discrimination and unemployment. *Prerequisites: ECO 203, ECO 204*

ECO 306: Urban Economics**3 Credits**

Objectives: This course provides an introductory economic analysis of selected urban management problems in the context of the regional economy.

Topics: Location and growth of cities; System of cities & urban hierarchy; Economics of urban management; Management of urban environment and waste management; Structure of the urban government and Policy issues; Local taxes, urban enterprise zones, urban land and housing policies; Anti-poverty policies and social cost & benefit of externalities. *Prerequisites: ECO 203, ECO 204*

ECO 322: Gender and Development**3 Credits**

Objectives: The course is designed to examine gender discrimination & gender equality as it relates to economic development.

Topics: Gender and development; Theoretical models of women's participation in economic activities; Valuation of household work by women; Education, Wage differentials, occupational segregation, labour force participation and difference in men's and women's professions; Economics of child care; Strategies for improving women's economic options; NGO activities involving women's participation in development. *Prerequisites: ECO 203, ECO 204*

ECO 323: Health Economics**3 Credits**

Objectives: This course provides an introduction to the economics of the health care sector and examines contemporary policies issues.

Topics: Welfare economics of health as a commodity; Management of health care system; Design and financing of health insurance; Medical manpower and human capital; Role of competition in health care market; Effects of government regulations; Health services and the non-profit sector; Empirical studies of demand and supply of health care services. *Prerequisites: ECO 203, ECO 204*

ECO 325: Political Economic Analysis**3 Credits**

Objectives: The objective of this course is to provide an economic analysis of the formation and operation of government and state.

Topics: Definition and Scope of Political Economy; Domestic and International Dimensions of Political Economy; History of Political Economy; Decentralization and Privatization; Governance issues in Political Economy; Political Economy and Economic Development; Globalization, Regionalism and National Autonomy; MNCs, Labour and Capital Movement. *Prerequisites: ECO 101, ECO 102*

ECO 331: Corporate Economics and Finance**3 Credits**

Objectives: This course provides an advanced analysis of monetary and financial economics.

Topics: Various models of demand for money-transactions cost model, portfolio models; Detailed modeling of the money supply process and financial theories; Portfolio models of asset demand-CAPM and other models; General equilibrium analysis of a monetary economy; Analytical study of financial institutions, financial markets and instruments. *Prerequisites: ECO 203, ECO 205*

ECO 401: Research Methods in Economics and Social Sciences**3 Credits**

Objectives: Introduction and application of various tools and techniques of research in Economics and Social Sciences. This course also involves preparation and presentation of independent seminar paper.

Topics: Purpose of scientific research; Features & scope and limitations of research; Classification of scientific research; Formulating research ideas and proposal development; Sampling design and methods; Data collection techniques and various biases in data collection; Writing guidelines.
Prerequisite: ECO 303 (or ECO 202 and Permission of Instructor for Sociology Minor students)

NB: This course will also be offered as SOC 401: Issues and Methods of Research, with specific modules and individual research projects specifically tailored for students of Sociology Minor.

ECO 421: Welfare Economics and Development**3 Credits**

Objectives: This course aims to provide a basic introduction to welfare theories and their various applications in economics.

Topics: Review of Efficiency and Optimality conditions; Fundamental theorems of welfare economics; Measuring welfare change-Consumer Surplus, Compensating and Equivalent Variations; Externality and Market failure; Property rights and the Coase theorem; Theory of second best and its implications for policy reforms. *Prerequisites: ECO 203, ECO 205*

ECO 422: Human Capital and Development**3 Credits**

Objectives: The main objective of this course is to provide an understanding of the role of human capital formation and development.

Topics: Determinants of human capital accumulation; Education and economic growth & development; Intergenerational models of household utility; Market for education; Government intervention; NGOs and education services; Child labour and education. *Prerequisite: ECO 311*

ECO 430: Econometric Analysis**3 Credits**

Objectives: The objective of this course is to equip the students with advanced econometric techniques of economic data analysis.

Topics: OLS regression using matrix approach; GLS and FGLS estimation and Non-linear models; Model selection and Specification problems; Panel Data models; System of Equations and Simultaneous equation models; Models of Discrete choice; Dynamic equation and distributed lag models; Time series models. *Prerequisites: ECO 205, ECO 303*

ECO 491: Introduction to Game Theory**3 Credits**

Objectives: This course aims to provide a basic introduction to game theory and its various applications in economics.

Topics: Static games of complete information and applications; Dynamic Games of complete information and applications; Static and dynamic Bayesian games and applications; Asymmetric information and Signaling games; Repeated games. *Prerequisites: ECO 203, ECO 205*

ECO 492: Advanced Mathematical Economics**3 Credits**

Objectives: This course provides an introduction to the advanced mathematical tools used in advanced economic theory. The course is aimed for students who are planning to pursue graduate studies in economics.

Topics: Introduction to Real Analysis and Set Theory; Introduction to Topological spaces; Functions, Sequences and Continuity; Linear Spaces; Compactness and Connectedness; Fixed Point Theorems; Applications in Economic Theory. *Prerequisites: ECO 205, MAT 216*

ECO 493: Industrial Organization**3 Credits**

Objectives: This course aims to provide an introduction to theory of organization of markets and firms.

Topics: Organization of the firm; Monopoly and price discrimination; Oligopoly, monopolistic competition; Product selection and advertising; Patent and R & D policies; Public and Social enterprises; Focus on public policy issues in industrial organizations. *Prerequisites: ECO 203, ECO 205*

ECO 494: Open Economy Macroeconomics**3 Credits**

Objectives: The main objective of this course is to discuss advanced theory and policy regarding international economic issues.

Topics: International mobility of saving and investment flows; International Capital market; Monetary and fiscal policy within the Mundel-Flemming model framework; Overshooting model of exchange rate; International transmission of economic disturbances; Domestic impact of international economic policies; Causes and consequences of balance of payment deficits. *Prerequisites: ECO 203, ECO 204*

ECO 498: Independent Study**3 Credits**

Objectives: This course offers a supervised study or research on special topics in economics.

Description: Students complete individualized plans of study involving significant one-on-one student-teacher interaction. The faculty member and student negotiate a study plan contract. The frequency and number of meetings depend upon the requirements of the topic. Evaluation is done on the basis of conferences and a written report.

Topics: Mutually agreed upon by instructor and student. *Prerequisite: Permission of Departmental Chair and Supervisor*

ECO 499: Thesis Research**6 Credits**

Objectives: The main objective of this course is to develop an in-depth program of research, under the direction of a faculty member of the department (thesis supervisor). This is a two semester long supervised thesis for the students undertaken during the last two semesters of their study.

Description: For successful completion of the course, in the first semester the student needs to prepare a comprehensive research proposal. The proposal includes a topic statement, a review of the literature, the research methodology, sources of data and potential results. During the second semester the student needs to complete the research project proposed in the first semester. The completed thesis paper is graded by the supervisor and another faculty member of the department (selected by the thesis committee) individually. The final grade is derived by taking average of the two grades provided by the supervisor and the other faculty member.

Topics: Mutually agreed upon by instructor and student and approved by the thesis committee. *Prerequisite: Permission of Departmental Chair and Thesis Committee*

SOCIAL SCIENCE COURSES**SOCIOLOGY****SOC 101: Introduction to Sociology****3 Credits**

Objective: This course provides students with an introduction to the discipline that studies human social life, groups and societies.

Topics: Culture, Values and Norms; Social Institutions: Marriage, Family, Economy, Education, Politics, Gender, Religion etc.; Class; Ethnicity; Deviance; Poverty; Rural Sociology and Development. *Prerequisites: None*

SOC 102: Bangladesh History, Culture and Society**2 credits**

Bangladesh, location and geomorphic characteristics. Early settlements and society. Economic and political base. Ethnic and cultural background. Historical periods and achievements. Colonization and social changes. Partition and the search of national and political identity. Bengali culture and nationalism. Influence of social, historical and cultural forces on settlement patterns. The background to the independence movement. The liberation war and subsequent events. Political, social and economic forces and the current state of the nation. *Prerequisites: none*

SOC 201: Stratification, Inequality & Power**3 Credits**

Objective: A sociological examination of the various factors underlying differences in wealth, power, and prestige in contemporary rural and urban societies in primarily developing, but also developed societies.

Topics: Class; Status; Ethnicity; Race; Gender; Family; Wealth and Poverty; Institutional Stratification; Political Inequality; Theories of Power. *Prerequisite: SOC 101*

SOC 301: Sociological Theory**3 Credits**

Objectives: A critical investigation of both the classical foundations of social thought, as well as an introduction to contemporary sociological debates.

Topics: Major theoretical paradigms regarding: Social order and integration; Social structure and action; Social change; Social norms and roles; Class and stratification; Deviance; Link between micro and macro-sociology; Scientific status of sociological theory; Original works: Marx, Weber, & Durkheim; Contemporary theorists. *Prerequisite: SOC 101*

SOC 310: Population and Society**3 Credits**

Objectives: To study how population structure and processes such as fertility, mortality and migration affect society and are, in turn, affected by changes in social structure and processes.

Topics: Global population trends; Demographic concepts; Population theories; Population policies and debates; Population and development; Population and culture; Global, developed, developing world perspectives with special reference to Bangladesh. *Prerequisite: SOC 101*

SOC 320: Political Sociology**3 Credits**

Objectives: Analysis of the nature, distribution, and effects of power in political institutions and processes in both historical and contemporary society.

Topics: Relationship between political, economic, and cultural institutions and power; Political ideology; Historical and contemporary theories of the state; Governance; Political parties; Elites and masses; Voting; Collective behaviour and socio-political movements. *Prerequisites: SOC 101, SOC 301*

SOC 325: Theories and Problems of Nationalism**3 Credits**

Objectives: To investigate sociological, historical and political theories of nationalism and ethnicity, as well as various problems of nationalism and nation states in their historical context.

Topics: Concepts of ethnic and religious identity; Historical roots of nationalism; National security; Role of the state; Internationalism, diplomacy and foreign policy debates; Problems of dependency; Special focus on South Asia. *Prerequisite: SOC 101*

SOC 330: Sociology of Development**3 Credits**

Objectives: To introduce and examine the historical transformation of poverty and development discourse both in Bangladesh and abroad.

Topics: Past and current poverty theory, measurement and discourse; Current government and nongovernment poverty alleviation/welfare assistance policy and programmes; Economic

development and trade; Gender issues; Rural development; Urbanization and population.
Prerequisite: SOC 101

SOC 335: Urban Sociology

3 Credits

Objectives: To understand the historical origins and different physical forms of the city and also look at the wide range of institutions and problems that exist within them.

Topics: Historical evolution of cities around the world; Issues of race, class and ethnicity; Classical statements in urban sociology; The Chicago School: Urban Ecology; Theories of urbanism and comparative urbanism; Post Modern Urban Theories; Deviance and Crime; Urban planning.
Prerequisite: SOC 101

SOC 350: Women and Society

3 Credits

Objectives: To examine the nature and causes of women's historical and current position in society.

Topics: Classical gender theory; Recent developments in gender theory and current debates; Perceptions of femininity vs. masculinity; Patriarchy; Feminism and Postmodernism; Reproductive Rights; Marriage and Divorce; Women and the State. *Prerequisites: SOC 101*

SOC 351: Gender and Development

3 Credits

Objectives: To critically understand and examine the theoretical and policy approaches to women's integration into society and development.

Topics: Classic development theory; Historical approaches to women and development: WID, WAD and GAD; Household models of development; Women's employment: formal and informal labour; Education and health; Violence against women; Women's participation in politics and the State; Women and religion. *Prerequisites: SOC 101, SOC 350 or SOC 370*

SOC 370: Sociology of Marriage and the Family

3 Credits

Objectives: To introduce the subjects of marriage and the family from a sociological perspective and provide a historical and cross cultural theoretical examination and comparison of patterns of behaviour surrounding these institutions

Topics: Mate selection; Romantic love; Gender roles and effect of changing gender roles; Sex and sexuality; Divorce; Marital communication; Transition to parenthood and parenting; Extended kin and family networks; Domestic violence; Relationship between work and family; Changing composition of the family. *Prerequisites: SOC 101, SOC 350*

SOC 390: Sociology of Deviance

3 Credits

Objectives: To understand and examine the sociological study of the origins, causes, and control of deviance and deviant behavior.

Topics: Development of the sociology of deviance from 19th century functionalism to contemporary perspectives of class and politics; Varied theoretical approaches to deviance; Individual and group deviance; Drug use; Sexual deviance; Criminal behaviour; Marginal deviance; Career deviance. *Prerequisites: SOC 101, SOC 301*

SOC 410: The Individual, Society and Social Control

3 Credits

Objective: The detailed analysis of the interaction between the individual and society; and examination of the ways in which society impinges upon the individual's behavior.

Topics: Stages of socialization; Self-concept, identity, attitudes and social roles; Interactionist approach to development of the self; Social relationships; Deviance and social control; Historical account of development of formal and informal methods of social control; Formal social control and imprisonment; Contemporary issues: surveillance, use of media and technology to exercise control. *Prerequisites: SOC 101, SOC 301, SOC 390*

SOC 420: Sociology of Religion**3 Credits**

Objective: Religion exists in a social context, and always is shaped by and shapes its social context. Furthermore, religion itself is a socially constituted reality--that is, its content and structure are always formed from the socio-cultural world (language, symbols, groups, norms, interactions, resources, organizations, etc.). The sociology of religion is interested in understanding both the "social-ness" of religion itself and the mutually influencing interactions between religion and its social environment. In this class, we will analyze religious beliefs, practices, and organizations from a sociological perspective.

Topics: Classic sociological definitions and understandings of religion-Durkheim, Weber and Mead; Belief and Ritual; Religious Organizations, Institutions and Authority; Religious Experience; World Religions in a Historical and Sociological Perspective; Media and Religion; Religious Fundamentalism in a Modern Context; Secularization, Religious Persistence, & the Status of Religious Belief. *Prerequisite: SOC 101, SOC 301, SOC 390*

OTHER SOCIAL SCIENCES**ANT 101: Introduction to Anthropology****3 credits**

Objectives: The course looks at the social world from anthropological perspectives and orients the students with primary concepts, theories and methodologies of anthropology.

Topics: Scope of Anthropology; Culture and cultural diversity; Ethnicity; Gender and sexuality; Language and symbolic communication; Power: conflict and order; Religion and rituals; Colonialism and Nationalism; Health; Marriage, Family and Kinship; Anthropology and Globalization. *Prerequisite: None*

ANT 103: Society and Development**2 credits**

Study of society through the social science approach. Evolution of society. Rise of early civilizations, organisation of society. Pre-industrial forms of social state. Environmental resources and their distribution. Gender, kinship, and descent, religion, economics, politics, survival of ethnic groups. Social relationships and value systems. Culture: evolution of culture, culture and adaptation, contemporary forms of culture and society. Relationships between sociology and economics. Modern and traditional societies, comparisons and impacts. Culture and society. *Prerequisites: none*

DEV 101: Bangladesh Studies**3 Credits**

Socioeconomic profile of Bangladesh: agriculture, industry, service sector; Demographic Patterns; Social and Physical Infrastructure; Social Stratification and Power; Power Structures; Government and NGO activities in socioeconomic development; National issues and policies and the changing society of Bangladesh. *Prerequisites: none*

POL 101: Introduction to Political Science**3 credits**

A study of political systems and process with special reference to Bangladesh. Topics include nature and origin of state, sovereignty of state, forms of political units, liberty, law, process of politics, political structure, political ideas-democracy, socialism, nationalism., peoples' behavior in politics. Political system, process and problems of Bangladesh. *Prerequisite: None*

PSY 101: Introduction to Psychology**3 credits**

The objective of this course is to provide knowledge about the basic concepts and principles of psychology pertaining to real-life problems. The course will familiarize students with the fundamental process that occur within organism-biological basis of behavior, perception, motivation, emotion, learning, memory and forgetting and also to the social perspective-social perception and social forces that act upon the individual. *Prerequisite: None*

PSY 401: Industrial Psychology**3 credits**

Jobs and their requirements; Principles of personnel testing; Measurement of human abilities; Personality and interest factors; Performance evaluation; learning and training; Measurement of attitudes and opinions; Motivation and job satisfaction; Financial incentives and job evaluation and human error. *Prerequisites: MGT 201, MGT 211, MGT 301.*

PSY 421: Psychology for Architects**2 credits**

Introduction to psychology. Understanding the human behaviour. Learning: factors of learning, classical conditioning, instrumental conditioning. Perception . Motivation and emotion. Fulfilment of and frustration of motives. Nature of emotional development, emotion and personality. Sensory processes, vision, auditory and olfactory process. Colour perception and effects. Perception of space. Psychological variations due to differences in colour, space and location. Effects of the spatial environment on motivation and emotion. Social influences on behaviour. Child psychology and spaces for children. *Prerequisites: none*

Department of Mathematics and Natural Sciences

Content of courses for BS in Physics, Applied Physics & Electronics, Mathematics and other courses offered by the MNS Department for different disciplines of BRACU are given in the following:

Course Descriptions

a. Theoretical Courses:

APE 101: Mechanics, Properties of Matter, Waves & Oscillations **3 credits**

Vectors & scalars, unit vectors, scalar and vector products, scalar and vector fields, gradient, divergence and curl, curvilinear co-ordinates, 1 D & 2 D motions, work and energy, conservation laws, conservative force, projectile motion, uniform circular motion, rotation of rigid bodies, angular momentum, gravitation, gravitational field, potential.

Elasticity, Hooke's Law, adhesive and cohesive forces, molecular theory of surface tension, capillarity. Streamline & turbulent flow, Poiseuille's formula, streamline flow and turbulent flow, Reynold's Number, Equation of Continuity, Bernoulli's Theorem, Stokes' Law.

Principle of superposition, interference of waves, phase velocity and group velocity, simple harmonic motion, combination of SHM, Lissajous figures, damped SHM, forced oscillations, resonance, power and intensity of wave motion, waves in elastic media, vibration of strings, beats, Doppler Effect, velocity of sound, ultrasonics, and their applications.

APE 102: Thermal Physics, Radiation & Statistical Mechanics **3 credits**

Heat and temperature, thermal equilibrium, specific heat & calorimetry, Newton's Law of Cooling, Kinetic Theory of Gases, Boltzmann Distribution Law, Brownian motion, Law of equipartition of energy; Vander Waals' equation of state, heat transfer, conduction, convection and radiation, coefficient of thermal conductivity and its measurement, First Law of thermodynamics, isothermal & adiabatic changes, reversible and irreversible processes, Carnot's cycle, Second Law of thermodynamics, entropy and disorder, absolute scale of temperature, Maxwell's relations, Clausius-Clapeyron Equation, Gibb's phase rule, Third Law of thermodynamics, Nernst heat theorem, radiation theory, black body radiation, Wien's Law, Stefan-Boltzman Law, Rayleigh Jeans Law, Planck's Law, variation of specific heat with temperature, Einstein's theory, Debye's theory, Joule-Thomson expansion, cryogenics, measurement of high temperature.

Statistical Mechanics: Phase space, concept of state and ensemble, microcanonical, canonical and grand canonical ensembles, Boltzmann probability distribution, Maxwell velocity distribution, derivation of Bose-Einstein and Fermi-Dirac statistics, ideal Fermi gas, degenerate Fermi system, equation of state of ideal gases, ideal Bose gas.

APE 103: Electrical Circuits I **3 credits**

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including supernode and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and Superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits. *Prerequisite: PHY 115*

APE 201: Solid State Physics and Materials Science **3 Credits**

Crystalline state, Bravais lattices, crystal symmetry, point group & space group, unit cells, Miller indices, x-ray diffraction, Bragg's Law, reciprocal lattice, structure factor, interatomic force and

classification of solids, ionic, covalent, molecular, hydrogen bonded crystals, lattice energy of ionic crystals, Madelung constant, lattice vibration, phonons, normal modes in monatomic and diatomic linear chains, theory of specific heat, Einstein and Debye models, thermal expansion, defects in crystals, dislocations, consequences of defects on mechanical properties, elastic properties. Amorphous, composite, fibrous materials, polymers, plastics, binding forces, thermal and electrical conductivity of metals, dielectric properties of solids, modes of dielectric polarisation, ferroelectricity, piezoelectricity, optical properties of solids, classical and semi-classical theory, free carrier effects, lattice absorption, electronic absorption, magnetic properties of solid, diamagnetism and paramagnetism, ferro & ferrimagnetism, antiferromagnetism, ferrites, magnetic resonance, superconductivity, liquid crystals.

APE 202: Electrodynamics & Electromagnetic Waves & Fields **3 Credits**

Solution of Laplace's equation and Poisson's equation and applications to electrostatic problems, dielectrics, electrostatic energy, Maxwell's equations, electromagnetic waves, propagation of electromagnetic waves in conducting and non-conducting media, reflection and refraction, polarization, dispersion, scattering, waves in the presence of metallic boundaries, Waves between parallel planes, attenuation, wave impedance, waves in coaxial lines & modes, waves in strip and micro-strip lines, waveguides and resonators, solution of the inhomogeneous wave equations, simple radiating system, antennas, accelerated charge, Cerenkov radiation, elements of plasma physics. *Prerequisite PHY 115.*

APE 203: Electrical Circuits II **3 credits**

Sinusoidal functions: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. Analysis of single phase ac circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in ac circuits, circuits simultaneously excited by sinusoidal sources of several frequencies, transient response of RL and RC circuits with sinusoidal excitation. Resonance in ac circuits: Series and parallel resonance. Magnetically coupled circuits. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation. *Prerequisite APE 103*

APE 204: Digital Logic Design **3 credits**

An introduction to digital systems such as computer, communication and information systems. Topics covered include Boolean algebra, digital logic gates, combinational logic circuits, decoders, encoders, multiplexers. Asynchronous and synchronous counters. Registers, flip-flops, adders, Sequential circuit analysis and design. Simple computer architecture.

APE 205: Electronic Devices and Circuits I **3 credits**

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified dc and ac diode models, dynamic resistance and capacitance. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits. Bipolar junction transistor (BJT) as a circuit element: Basic structure. BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch. Single stage BJT amplifier circuits and their configurations: Voltage and current gain, input and output impedances. Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET) as circuit element: structure and physical operation of MOSFETs, body effect, current-voltage characteristics of MOSFETs, biasing discrete and integrated MOS amplifier. *Prerequisite: APE 103*

APE 302: Electronic Devices and Circuits II **3 credits**

Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers. Operational amplifiers

(Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, dc imperfections. General purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741 Op-Amp. Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation. Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and bandpass filters using Op-Amps. Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages. *Prerequisite APE 205*

APE 400: Thesis / Project

3 credits

A student is required to carry out thesis/project work in the 7th and 8th semester in a chosen field. There will be a supervisor who will either be a BRAC University faculty or any other suitable expert from universities and R/D organizations of the country to guide the thesis/ project work .On completion of study and research s/he will have to submit the dissertation/report and face a viva board for the defence.

Internship

1 credit

The internship aims at providing on the job exposure to the students and an opportunity for translating theoretical concepts to real life situations. Students will be placed at R/D institutions, electronic & IT firms etc. for their internship programmes.

APE 401: Measurements & Measuring Instruments

3 Credits

Significance and methods of measurements, direct and indirect methods. Mechanical, electrical and electronic types of instruments, absolute and secondary instruments, analog and digital instruments, analog voltmeters and ammeters, AC transformer types, Flux gate magnetometer type. Accuracy and error of analog voltmeters and ammeters. Different types of Digital voltmeters, digital multimeters, Automation in multimeters.

Oscilloscopes, signal generators. Transducers. Absorption and detection of radiation, Nucleonic instruments. Analytical & medical instruments, Industrial instruments, Instrument systems. *Prerequisite APE 302*

APE 402: Plasma Physics with Industrial Applications

3 credits

General introduction to plasma physics, plasma as a fourth state of matter, definition, screening and Debye shielding, plasma frequency, ideal plasma, temperature and pressure of plasma, magnetic pressure and plasma drifts, plasma waves, Landau damping, collisions in plasmas, hydrodynamic description of plasma, one fluid model, two fluid model, Chew-Goldberg theory, low waves in maneto-hydrodynamics, description of plasma, dielectric tensor, longitudinal and transverse waves, plasma instabilities, transport in plasmas, plasma kinetic theory, Vlasov equation, linear waves, waves in magnetized plasma, electromagnetic waves, waves in hot plasmas, nonlinear waves, Landau damping, quasi linear theory, plasmas in fusion research, plasmas in industrial applications.

APE 403: Control Engineering

3 credits

Introduction to control systems, electric circuits and components, transfer function and block diagram, mechanical translation systems, analogous circuits, mechanical rotational systems, rotating power amplifiers, DC & AC servomotors.

Inputs & responses, modeling of continuous systems; computer-aided solutions to systems problems; feedback control systems; stability, frequency response and transient response using root locus, frequency domain and state variable methods. Position control system, simulation diagrams, signal flow graphs, parallel state diagrams from transfer function. General frequency transfer function relationships, drawing the Bode plot, system type and gain as related to log

magnitude curve, Nyquist's criterion and applications. *Prerequisites: ECE 220 and MAT 203*

APE 404: Microprocessors and Assembly Language Programming **3 credits**

Introduction to different types of microprocessors. Microprocessor architecture, instruction set, interfacing/O operation, interrupt structure, DMA. Microprocessor interface ICs. RAM, ROM, PROM, EPROM and EEPROM's. Advanced microprocessor concept of microprocessor based system design. Microcomputer systems, representation of numbers and characters, introduction to IBMPC assembly language. Logic, shift, multiplication & division instructions, arrays and addressing modes, string instructions, text display and keyboard programming, memory management. *Prerequisite APE 204*

APE 405: Computer Organization and Architecture **3 credits**

A systematic study of the various elements in computer design, including circuit design, storage mechanisms, addressing schemes, and various approaches to parallelism and distributed logic. Information representation and transfer; instruction and data access methods; CPU structure and functions processor and register organization, instruction cycles and pipe linings, the control unit; memory organisation. RISC and CISC machines. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite APE 204.*

APE 406: Radar Engineering **3 credits**

The course is oriented towards the understanding and design of radar systems. The contents will be radar principles & techniques, nature of radars, radar frequencies, radar target, radar equation, continuous & frequency modulated radars, detection & processing of radar signals, MTI radar, Pulse Doppler radar, tracking radar, radar indicators and displays, noise, ground & sea echoes & clutter, weather effect of radar, radar applications. *Prerequisites: ECE 220 and MAT 203*

APE 407: Renewable Energy Technology **3 credits**

Energy & development, energy consumption, world energy demand & future projection, energy units, earth's energy resource base, renewable and non-renewable sources of energy. Non-renewable energy sources-fossil fuels, coal, natural gas, petroleum, etc. and non-fossil fuels like uranium (fission energy).

Renewable energy sources-solar energy, wind energy, tidal & wave & ocean energy, geothermal energy, biomass & hydropower, hydrogen energy. Advantages of renewable over conventional technologies, solar thermal conversion, radiation characteristics of materials, solar collectors, solar photovoltaic energy conversion, photovoltaic cells, design of PV systems, wind turbines, biopower, biofuels, integrated bioenergy systems, geothermal heat pumps, hydroelectricity & micro hydroelectric power, ocean thermal energy conversion. Energy, sustainability and environment, EIA.

BIO 101: Introduction to Biology **3 credits**

An introduction to the cellular aspects of modern biology including the chemical basis of life, cell theory, energetics, genetics, development, physiology, behaviour, homeostasis and diversity, and evolution and ecology. This course will explain the development of cell structure and function as a consequence of evolutionary process, and stress the dynamic property of living systems.

CHE 101: Introduction to Chemistry **3 credits**

The course is designed to give an understanding of basics in chemistry. Topics include nature of atoms and molecules; valence and periodic tables, chemical bonds, aliphatic and aromatic hydrocarbons, optical isomerism, chemical reactions.

CHE 110: Principles of Chemistry **3 credits**

Atomic structure, quantum theory. Atomic spectrum of hydrogen and the Bohr model for electron orbits and energy levels, quantum numbers. Electronic configuration, periodic table, valence. Chemical bonding and molecular structure. Chemical formulas and equations, oxidation and

reduction. Gas laws, ideal gas equation, kinetic theory of gases. thermochemistry, chemical kinetics and chemical equilibria. Different types of solutions, their properties, strengths. Acids and bases, pH values. Phase rule. Introduction to organic chemistry and selective organic reactions. Modern perspectives of chemistry in the context of energy, environment, materials science, electronics etc.

ENV 101: Introduction to Environmental Science

3 credits

Fundamental concepts and scope of environmental science, Earth's atmosphere, hydrosphere, lithosphere and biosphere, man and nature, technology and population, ecological concepts and ecosystems, environmental quality and management, agriculture, water resources, fisheries, forestry and wildlife, energy and mineral energy sources; renewable and non renewable resources, environmental degradation; pollution and waste management, environmental impact analysis, remote sensing & environmental monitoring.

GEO 101: Introduction to Economic Geography

3 credits

Introduction: The field and environment of economic Geography; Bases of Economic Geography: Relief, Climate, Vegetation, Soils and Population; Extractive resources and human-environment relations; Primary Activities: types and brief descriptions; Secondary Activities: types and factors of localization, Stages in growth; Tertiary Activities: Trade, Transportation, Utilities, Technical and Professional services; Regional Economy: classification, Growth and Development; Economic Geography of Bangladesh: A brief account.

MAT 091: Basic Course in Mathematics

0 credit

Topics including sets, relations and functions, real and complex numbers system, exponents and radicals, algebraic expressions; quadratic and cubic equations, systems of linear equations, matrices and determinants with simple applications; binomial theorem, sequences, summation of series (arithmetic and geometric), permutations and combinations, elementary trigonometry; trigonometric, exponential and logarithmic functions; co-ordinate geometry; statics-composition and resolution of forces, equilibrium of concurrent forces; dynamics-speed and velocity, acceleration, equations of motion.

MAT 101: Fundamentals of Mathematics

3 credits

The real number system, exponents, polynomial, factoring, rational expression, radicals, complex number, linear equation, quadratic equation, variation, inequalities, coordinate system, functions, equations of line, equation of circle, exponential and logarithmic function, system of equations, system of inequalities properties of matrix, matrix solution of linear system, determinant, Cramer's rule, limit, rate of change, derivative.

MAT 102: Introduction to Mathematics

3 credits

Factorisation, Synthetic Division, Zeros (Roots) of Polynomials, Relation between Roots and Coefficients, Nature of Roots (Descarte's Rule of signs); Complex Number System, Graphical representation of Complex Numbers (Argand Diagram), Polar form of Complex Numbers; Conic Sections, Parabola, Circle, Ellipse, Hyperbola, Transformation of Coordinates and Applications; Exponential Growth & Decay. Applications; Mathematical Induction; Determinants, Fundamental Properties of Determinants, Minors and Cofactors, Application of Determinants to solve System of Linear Equations (Cramers, Rule); Introduction to Matrix Algebra, Matrix Multiplication, Augmented Matrix, Adjoint Matrix, Inverse Matrix, Application of Matrices-solution of System of Linear Equations (homogeneous & non-homogeneous), Consistency of System of Equations.

MAT 103: Basic Concepts in Mathematics

3 credits

The real numbers, Absolute value of real numbers, Exponents, Polynomials, Basic operation and Factoring of polynomials, Rational expressions, Radicals. Linear Equations, Solution, graphs and applications. Variation, Linear inequalities. Exponential and Logarithmic Functions, Exponential growth and decay, Ratios, proportions, percent, application of simple and compound interest.

Trigonometric Functions, The Sine and Cosine Functions, Cartesian coordinate systems, Graphing, Relations. Equations of a straight line its slope, Equation of a circle, Systems of Linear Equations, Matrix. Population, Sample, Variable, Raw data, Frequency distribution table, Graphical presentation, Measures of central tendency and measures of dispersion.

MAT 104: Mathematics

2 credits

Calculus, definition of limit, continuity and differentiability, successive and partial differentiation, maxima and minima. Integration by parts, standard integrals, definite integrals. Solid geometry, system of coordinates. Distance between two points. Coordinate Transformation, Straight lines sphere and ellipsoid.

MAT 105: Calculus

3 credits

Differential Calculus: Limits, continuity and differentiability, differentiation, Taylor's, Maclaurine's & Euler's theorems, indeterminate forms, tangent and normal, sub tangent and subnormal, maxima and minima, radius of curvature & their applications, introduction to calculus of function of several variables, Taylor's theorem, maxima and minima for function of several variables. Transformation of coordinates & rotation of axes, conic sections.

Integral Calculus: Definition of integration, techniques of integration for definite & indefinite integrals, improper integrals, area, volume and surface integration, arc length and their applications, multiple integrals, Jacobian, line integrals, divergence theorem and Stokes' theorem, beta function and gamma function.

MAT 110: MATH I: Differential Calculus and Co-ordinate Geometry

3 credits

Differential Calculus: Limits, Continuity and differentiability. Differentiation. Taylor's Maclaurine's & Euler's theorem. Indeterminate forms. Partial differentiation. Tangent and normal. Subtangent and subnormal. Maximum and minimum, radius of curvature & their applications. Co-ordinate Geometry: Transformation of coordinates & rotation of axis. Pair of straight lines. General equation of second degree. System of circles. Conics section. Tangent and normal, asymptotes & their applications.

MAT 111: Principles of Mathematics

3 credits

Sets: Elementary idea of Set, Set notations, Set operations: union, intersection, complement, difference; Set operations and Venn diagrams. Set of Natural numbers, Integers, Rational numbers, Irrational numbers and Real numbers alongwith their geometrical representation, Idea of Open and Closed interval, . Idea of absolute value of real number, Variables and Constants, Product of two sets: Idea of product of sets, Product set of real numbers and their geometric representation, Axioms of real number system and their application in solving algebraic equations. Equation and Inequality, Laws of inequality, Solution of equations and inequalities. Variable and Functions: Variable of a set, Functions of single variable, Polynomial, Graph of Polynomial functions in single variable. Exponential, Logarithmic, Trigonometric functions and their graphs, Permutation and Combination. Binomial theorem.

MAT 120: MATH II: Integral Calculus and Differential Equations

3 credits

Integral Calculus: Definitions of integration. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formula. Improper integrals. Beta function and Gamma function. Area under a plane curve in Cartesian and polar coordinates. Area of the region enclosed by two curves in Cartesian and polar coordinates. Trapezoidal rule. Simpson's rule. Arc lengths of curves in Cartesian and polar coordinates, parametric and pedal equations. Intrinsic equations. Volumes of solids of revolution. Volume of hollow solids of revolutions by shell method. Area of surface of revolution. Ordinary Differential Equations: Degree of order of ordinary differential equations. Formation of differential equations. Solution of first order differential equations by various methods. Solutions of general linear equations of second

and higher order with constant coefficients. Solution of homogeneous linear equations. Applications. Solution of differential equations of the higher order when the dependent and independent variables are absent. Solution of differential equations by the method based on the factorisation of the operators. [Students will be expected to attend a 3 hour tutorial class, once each week and submit tutorial worksheets.] *Prerequisite: MAT 110*

MAT 121: Basic Algebra

3 credits

Elements of logic: Mathematical statements, Logical connectives, Conditional and biconditional statements, Truth tables and tautologies, Quantifications, Logical implication and equivalence, Deductive reasoning. The concept of sets: Sets and subsets, Set operations, Family of Sets. Relations and functions: Cartesian product of two sets, Relations, Order relation, Equivalence relations, Functions, Images and inverse images of sets, Injective, surjective, and bijective functions, Inverse functions. Real number system: Field and order properties, Natural numbers, integers and rational numbers. Absolute value, Basic inequalities. (Including inequalities of means, powers, Weierstrass, Cauchy) Complex number system: Field of complex numbers, De Moivre's theorem and its applications. Elementary number theory: Divisibility, Fundamental theorem of arithmetic, Congruence. Summation of finite series: Arithmetic-geometric series, Method of difference, Successive differences, Use of mathematical induction. Theory of equations: Synthetic division, Number of roots of polynomial equations, Relations between roots and coefficients, Multiplicity of roots, Symmetric functions of roots, Transformation of equations.

MAT 122: Analytic and Vector Geometry

3 credits

Two dimensional geometry

Coordinates: Cartesian and polar Coordinates, Transformations of coordinates and its applications. Reduction of second degree equations to standard forms, Pairs of straight lines, Circles, Identification of conics, Equations of conics in polar Coordinates.

Three dimensional geometry

Coordinates in three dimensions, Direction cosines, and Direction ratios. Planes, straight lines, shortest distance, sphere, orthogonal projection and conicoids.

Vector geometry

Vectors in plane and space, Algebra of vectors, scalar and vector products, Triple scalar products, its applications to Geometry.

MAT 123 Calculus I

3 credits

Differential Calculus: Real number system and its geometrical representation, real variable, function of single (real) variable, parametric equations, limit, continuity and differentiability, derivatives of different types of functions, geometrical significance of derivative, Rolle's Theorem, Mean Value Theorem, Taylor's Theorem; maxima, minima, point of inflexion, concavity and convexity, sketching of curves using concepts of calculus; Indeterminate Form, L'Hospital Rule, Successive Differentiation, Leibnitz's Theorem, tangent, normal and related formulas, curvature.

Integral Calculus: Indefinite integrals of different types of functions, various methods of integrations, definite integrals, Fundamental Theorems of Definite Integrals, properties of definite integrals, Reduction formulas, Arc Length, Area under the curves, Surface area and Volume of a 3-D objects. Improper Integrals and applications. *Prerequisite: MAT122*

MAT 124 FORTRAN Programming

3 credits

Problem-solving techniques using computers: Flowcharts, Algorithms, Pseudocode. Programming in FORTRAN: Syntax and semantics, data types and structures, input/output, loops, decision statements, arrays, user-defined functions, subroutines and recursion. Computing using FORTRAN: Construction and implementation of FORTRAN programs for solving problems in mathematics and sciences.

MAT 203: Matrices, Linear Algebra & Differential Equations**3 credits**

Matrices: Types of matrices, algebraic operation on matrices, determinants, adjoint & inverse matrix, orthogonality & diagonalization of matrix.

Linear Algebra: System of linear equations, vector space; 2D- space, 3D- space, Euclidean nD- space, sub space, linear dependence, basis and dimension, row space, column space, rank and nullity, linear transformation, eigen value and eigen vector, matrix diagonalization and similarity, application of linear algebra.

Ordinary Differential Equations: Introduction to differential equations, first-order differential equations and applications, higher order differential equations and applications, series solutions of linear equations, systems of linear first-order differential equations. Prerequisite MAT 105

MAT 204: Complex Variables & Fourier Analysis**3 credits**

Complex Variables: Complex number systems, general functions of a complex variable, limits and continuity of a function of complex variables and related theorems, complex differentiation and Cauchy-Riemann equations, mapping by elementary functions, line integral of a complex function. Cauchy's integral theorem, Cauchy's integral formula, Liouville's theorem, Taylor's and Laurent's theorem, singular points, residue, Cauchy's residue theorem, evaluation of residues, contour integration and conformal mapping. Fourier analysis: Real and complex form, finite Fourier transform, Fourier integrals, Fourier transforms and their use in solving boundary value problems. Prerequisite MAT 105

MAT 205: Introduction to Numerical Methods**3 credits**

Computer arithmetic: floating point representation of numbers, arithmetic operations with normalized floating point numbers; iterative methods, different iterative methods for finding the roots of an equation $f(x) = 0$ and their computer implementation; solution of simultaneous algebraic equations by various methods, solution of tri-diagonal system of equations, interpolation for equispaced and non-equispaced nodes, least square approximation of functions, curve fitting, Taylor series representation, Chebyshev series, numerical differentiation and integration and numerical solution of ordinary differential equations & partial differential equations. Prerequisite MAT 203

MAT 211: Calculus II**3 credits**

Functions of several variables, concept of surface, sketching of $z=f(x,y)$, contour sketch for surface, limit and continuity, partial derivative and its geometrical significance, chain rule of partial differentiation, concept of gradient, divergence and curl, directional derivative and tangent plane, concept of differential and perfect differential, linear approximation and increment estimation, maxima, minima and saddle point, Lagrange multiplier, higher order derivatives, Taylor's theorem of function of several variables. Multiple integrals: Double integrals, Double integrals in Polar coordinates, Triple integrals, Triple integrals in Cylindrical and Spherical coordinates, Change of variables in Multiple integrals, Jacobian, Line integrals, Green's theorem, Surface integrals, Applications of Surface integrals, Divergence theorem, Stoke's theorem. Prerequisite: MAT123.

MAT 212: Linear Algebra**3 credits**

Introduction to matrix, different types of matrices, equivalent matrices, determinants, properties of determinants, minors, cofactors, evaluation of determinants, adjoint matrix, inverse matrix, method for finding inverse matrix, elementary row operations and echelon form of matrix, system of linear equations (homogeneous and non-homogeneous equations) and their solutions; Vector, vector spaces and subspaces, linear independence and dependence, basis and dimension, change of bases, rank and nullity, linear transformation, kernel and images of a linear transformation and their properties, eigenvalues and eigenvectors, diagonalization, Cayley Hamilton theorem.

MAT 215: MATH III Complex Variables and Laplace Transformations **3 credits**

Complex Variables: Complex number systems. General functions of a complex variable. Limits and continuity of a function of complex variables and related theorems. Complex differentiation and Cauchy-Riemann equations. Mapping by elementary functions. Line integral of a complex function. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem. Evaluation of residues. Contour integration. And conformal mapping Laplace Transforms: Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorems on Laplace transforms. Solutions of differential equations by Laplace transformations. Evaluation of improper integrals. *Prerequisite: MAT120*

MAT 216: MATH IV: Linear Algebra and Fourier Analysis **3 Credits**

Linear Algebra: Basic subject on matrix theory and linear algebra, emphasizing topics useful in other discipline, including systems of equations, vector spaces, determinants, Eigenvalues, similarity, and positive definite matrices, Applications to Gauss elimination with pivoting. Fourier Analysis: Real and complex form. Finite transform. Fourier integral. Fourier transforms and their uses in solving boundary value problems. Multiple integrals; surface and volume integrals, divergence and Stoke's theorem. *Prerequisite: MAT 120*

MAT 221: Real Analysis I **3 credits**

Real number system: Completeness of real numbers, supremum and infimum principles and their consequences, Dedekind's theorems, Bolzano-Weierstrass theorem. Sequences of Real Numbers: Infinite sequence, Convergent sequences, Monotone sequences, subsequences, Cauchy sequence, Cauchy criteria for convergence of sequences. Infinite Series: Concept of sum and convergence, series of positive terms, alternating series, absolute and conditional convergence, test for convergence, Convergence of sequences and series of functions. Continuity and Limits: Properties of continuous functions, Extreme Value Theorem and Intermediate Value Theorem, Uniform continuity concepts, Limits, Heine-Borel theorem. Integration: Necessary and sufficient conditions for integrability, Darboux Sums and Riemann Sums, Improper integral and their tests for convergence.

MAT 222: Differential Equations I **3 credits**

Ordinary differential equations and their solutions: Classification of differential equations, Solutions, Implicit solutions, Singular solutions, Initial Value Problems, Boundary Value Problems, Basic existence and uniqueness theorems (statement and illustration only), Solution of first order equations: Separable equations, Linear equations, Exact equations, Special integrating factors, Substitutions and transformations, Modeling with first order differential equations, Model solutions and interpretation of results, Orthogonal and oblique trajectories, Solution of higher order linear equations: Linear differential operators, Basic theory of linear differential equations, Solution space of homogeneous linear equations, Fundamental solutions of homogeneous solutions, Reduction of orders, Homogeneous linear equations with constant coefficients, Non homogeneous equation, Method of undetermined coefficients, Variation of parameters, Euler Cauchy differential equation, Modeling with second order equations, Initial Value Problems and Boundary Value problems, reduction of order, Euler equation, generating functions, eigenvalue problems. Inhomogeneous linear difference equations (variation of parameters, reduction of order, Series solutions of second order linear equations: Taylor series solutions about an ordinary point. Frobenius series solutions about regular singular points. Series solutions of Legendre, Bessel, Laguerre and Hermite equations. Systems of linear first order differential equations: Elimination method. Matrix method for homogeneous linear systems with constant coefficients. Variation of parameters. Matrix exponential. *Prerequisite: MAT211*

MAT 223: Numerical Analysis I **3 credits**

Solution of equation of single variable: Fixed point iteration, Bisection algorithm, Method of False

position, Newton-Raphson's method, Error Analysis for Iterative methods, Accelerating limit of convergence. Interpolation: Interpolating polynomials for equispaced and nonequispaced nodes, Lagrange's polynomial, Newton-Gregory's Interpolating polynomials, curve fitting with Least Square method, Iterated interpolation, Extrapolation. Differentiation and Integration: Numerical differentiation, Single point and $(n+1)$ point formulae of differentiation, Richardson's extrapolation, Numerical Integration, Gaussian quadrature formula, Trapezoidal, Simpson's, Weddle's Rules. *Prerequisite: MAT124*

MAT 301: Group Theory

3 Credits

Definition and various examples of groups, subgroups, cosets, normal subgroups, quotient (factor) groups, permutation groups, cyclic groups, generator of a cyclic group, centre of a group, Abelian group, normalizer and centralizer of an element/ subset of a group and its application to physics, group homomorphism, isomorphism and automorphism and related theorems, symmetry groups, SU (3), SU (6), application of group theory in solid state physics & elementary particles.

MAT 303: Tensor Analysis

3 Credits

Definition of tensor, tensor density, affine tensor and geometrical object, properties of tensor symmetry, criteria of tensor properties, metric tensor, Kronecker symbol and Levi-Civita's symbol, determinant of metric tensor, connection between metric tensor and Dirac's matrices in the Sommerfeld representation, evolution of square root from four dimensional interval in matrix sense, transformation properties of vector partial derivatives by coordinates, connection coefficients and covariant derivatives, Christoffel's symbols, geodesic lines (geodetics) as a generalization of notion of straight line, variation principle for geodetics, parallel transport, connection between geodetics and covariant differentiation, transport along closed line curvature tensor of the 4th rank, curvature tensor of the 2 D rank, scalar curvature, equations of geodesic deviation, curvature expression in terms of Dirac's matrices, Bianchi's identity, Einstein's conservative tensor, integral operations and corresponding theorems.

MAT 311: Abstract Algebra

3 credits

Equivalence relation and residue classes modulo n. Groups and subgroups, Cyclic groups, Symmetric groups. Cosets and Lagrange's Theorem: Normal subgroups, Quotient groups, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups with related theorems and problems, Cayley's Theorem, centralizer and normalizer of an element/ subset in a group. Rings, Ideals, and Quotient Rings, Prime and Maximal Ideals. Integral Domain, Field of fractions. Principal Ideal Domain, Euclidian Domain, Unique Factorization Domain.

Polynomial Rings, Primitive polynomials, Gauss Theorem, Eisenstein's criterion for irreducibility. Prime Fields, characteristic of Fields. *Prerequisite: MAT121*

MAT 312: Numerical Analysis II

3 credits

Part A: Theory

Solutions of linear system of equations: Gaussian Elimination method with pivoting, Matrix inversion, Direct factorization of matrices, Iterative Techniques for solving linear system of equations: Jacobi's and Gauss-Seidel Method. Solution of tridiagonal system, Eigen values and Eigen vectors (Power Method). Numerical solution of Nonlinear system: Fixed point for functions of several variables, Newton's method, Quasi-Newton's method. Initial Value Problem for ODE: Euler's method, Higher order Taylor's method, Runge-Kutta methods, Multistep methods, Variable Stepsize Multistep methods. Boundary Value Problem: Linear Shooting method, Shooting method for non linear BVP. Boundary Value problem involving elliptic, parabolic and hyperbolic equations, explicit and implicit Finite Difference method.

Part B: Numerical Analysis Lab

Construction and implementation of FORTRAN / C, C++ programs of techniques in Numerical Analysis. There will be at least 15 lab assignments. *Prerequisite: MAT 223*

MAT 313: Differential Geometry**3 credits**

Curves in space: Vector functions of one variable, space curves, unit tangent to a space curve, equation of a tangent line to a curve, Osculating plane (or plane of curvature), vector function of two variables, tangent and normal plane for the surface $f(x, y, z)=0$, Principal normal, binormal and fundamental planes, curvature and torsion, Serret Frenet's formulae, theorems on curvature and torsion, Helices and its properties, Circular helix. Spherical indicatrix, Curvature and torsion. Curvature and torsion for spherical indicatrices. Involute and Evolute of a given curve, Bertrand curves. Surface: Curvilinear coordinates, parametric curves, Metric (first fundamental form), geometrical interpretation of metric, relation between coefficients E, F, G. properties of metric, angle between parametric curves, elements of area, second fundamental form. Derivatives of surface normal M (Weingarten equations), Third fundamental form, Principal sections, Principal sections, direction and curvature, first curvature, mean curvature, Gaussian curvature, normal curvature, lines of curvature, centre of curvature, Rodrigues's formula, condition for parametric curves to be line of curvature, Euler's Theorem, Elliptic, hyperbolic and parabolic points, Dupin Indicatrix.

MAT 314: Complex Analysis**3 credits**

Introduction to complex numbers and their properties, complex functions, limits and continuity of complex functions, Analytic functions, Cauchy Riemann equations, harmonic functions, Rational functions, Exponential functions, Trigonometric functions, Logarithmic functions, Hyperbolic functions. Contour integration: Cauchy's Theorem, Simply and Multiply connected domain, Cauchy integral formula, Morera's theorem, Liouville's theorem. Convergent series of analytic functions, Laurent and Taylor series, Zeroes, Singularities and Poles, residues, Cauchy's Residue theorem and its applications, Conformal Mapping. *Prerequisite: MAT123*

MAT 315: History of Mathematics**3 credits**

A Survey of the development of mathematics beginning with the history of numeration and continuing through the development of the calculus. The study of selected topics from each field is extended to the 20th century. Biographical and historical aspects will be reinforced with studies of procedures and techniques of earlier mathematical cultures.

MAT 316: Operations Research I**3 credits**

Convex sets and related theorems, Introduction to linear programming, Formulation of linear programming problems, Graphical solutions, Simplex method, Duality of linear programming and related theorems, Sensitivity. Unconstrained optimization: Newton's method, Trust region algorithms, Least Squares and zero finding. Constrained optimization: linear/nonlinear equality/inequality constraints, Duality, working set methods. Linear programming: Simplex method, primal dual interior point methods.

MAT 321: Real Analysis II**3 credits**

Metric spaces: definition and some examples, open sets, closed sets, Convergence, Completeness, Baire's theorem. Connected set: Compact sets, locally compact sets and related theorems, connected sets, locally connected sets, continuity and compactness. Sequence in metric space: Convergent and Cauchy sequence, Completeness, Banach Fixed Point theorem with applications, sequence and series of functions, pointwise and uniform convergence, differentiation and integration of series. Continuous function on metric space: Boundedness, Intermediate Value Theorem, uniform continuity. Differentiation in \mathbb{R}^n : Jacobian, implicit and inverse function theorems. Integration in \mathbb{R}^n : contents and integrals, Fubini's theorem, change of variables. *Prerequisite: MAT221*

MAT 322: Differential Equations II**3 credits**

ODE: Existence and uniqueness theory: Fundamental existence and uniqueness theorem. Dependence of solutions on initial conditions and equation parameters. Existence and uniqueness theorems for systems of equations and higher order equations. Eigen value problems and Strum-

Liouville boundary value problems: Regular Sturm-Liouville boundary value problems. Solution by eigenfunction expansion. Green's functions. Singular Sturm-Liouville boundary value problems. Oscillation and comparison theory. Nonlinear differential equations: Phase plane, paths and critical points. Critical points and paths of linear systems.

PDE: First order equations: complete integral, General solution. Cauchy problems. Method of characteristics for linear and quasilinear equations. Charpit's method for finding complete integrals. Methods for finding general solutions. Second order equations: Classifications, Reduction to canonical forms. Boundary value problems related to linear equations. Applications of Fourier methods (Coordinates systems and separability. Homogeneous equations.) Boundary value problems involving special functions. Transformation methods for boundary value problems, Applications of the Laplace transform. Application of Fourier sine and cosine transforms.
Prerequisite: MAT222.

MAT 323: Vector Mechanics

3 credits

Statics: Fundamental concept and principle of Mechanics. Statics of Particles: Review of vectors, vector addition of forces, resultant of several concurrent forces, resolution of forces into components, equilibrium of particles in a plane and in space. Rigid bodies: momentum of a force and a couple, Varignon's theorem, equivalent system of forces and vectors, reduction of system of forces. Equilibrium of rigid bodies: reactions at supports and connections of rigid bodies in two dimensions. Centroid and center of gravity: CG of two and three dimensional bodies, centroids of areas, lines and volumes. Moment of inertia, moments and products of inertia, radius of gyration, parallel axis theorem, principal axis and principal moments of inertia.

Dynamics: Kinematics of particles: rectilinear and curvilinear motion of particles. Kinematics of particles: Newton's second law of motion, linear and angular momentum of a particle, conservation of energy and momentum, principle of work and energy and their applications, motion under a central force and conservative central force, impulsive motion. System of particles: Newton's law, effective forces, linear and angular momentum, conservation of momentum and energy, work energy principle. Kinematics of rigid bodies: translation, rotation, and plane motion relative to rotating frame, Coriolis force. Plane motion of a rigid body: motion in two dimensions, Euler's equation of motion about a fixed point. *Prerequisite: MAT122.*

MAT 324: Discrete Mathematics

3 credits

Number System: Numbers with different bases, their conversion and arithmetic operations, normalized scientific notations. Logic: Introduction to logic, logical operations, application of logic to sets. Mathematical Reasoning: Methods of proof, Mathematical induction, recurrence relations, generating functions. Boolean Algebra: Ordered sets, lattices, Boolean algebra and operations, Boolean expressions, logic gates, minimization of Boolean expressions, Karnaugh maps, Karnaugh map algorithm. Graphs: introduction and definitions, representing graphs, graph isomorphism, connected graph, planar graph, path and circuit, shortest path algorithm, Eulerian path, Euler's theorem, Seven Bridges of Königsberg Problem, graph coloring. Application of graph: tree, tree reversal, trees and sorting, spanning trees, minimum spanning trees: related algorithms. Search trees: binary search tree, leaves on a rooted tree, spanning trees and the MST problems, network and flows, the max flow and the min-cut theorem. Binary trees.

MAT 325: Mathematical Methods

3 credits

Series solution: singularity of a rational function, series solution of linear differential equations at nonsingular and regular singular points. Fourier series: Introduction to orthogonal functions and Integral transform, Fourier integral, Fourier transform and their applications. Laplace transformation method: Definition, existence and properties of Laplace transform, Inverse Laplace transform, Transforms of discontinuous and periodic functions. Convolution. Impulses and Dirac delta function. Solving initial value problems. Solving linear systems, Harmonic functions: Laplace equation in different coordinates and its applications. Special functions:

Legendre functions of first and second kinds, Hermite polynomials, generating function, Hypergeometric functions, Laguerre functions, Bessel function and their properties. *Prerequisite: MAT 322*

MAT 326: Hydrodynamics

3 credits

Preliminaries: Concept of viscosity; Inviscid fluid; stream line, path line and streak lines; steady and unsteady motion. Equation of motion: Equation of continuity; Euler's equation of motion, conservative forces, Bernoulli's equation; circulation and Kelvin's circulation theorem; vorticity, irrotational and rotational motion, velocity potential; energy equation, Kelvin's minimum energy theorem. Two dimensional motion: vorticity, stream function and velocity potential function, streaming motion, complex potential and complex velocity, stagnation points, motion past a circular cylinder, circle theorem, motion past a cylinder, Joukowski transformation, Blasius theorem; two dimensional source, sink and doublets, source and sink in a stream, the method of image. Vortex motion: vortex line, tube and filament, rectilinear and circular vortices, kinetic energy of system of vortices, vortex sheet, Karman's vortex street.

MAT 400: Project /Thesis

3 Credits

A student is required to carry out project / thesis work in the last two semesters in her/his chosen field. There will be a supervisor who will either be a BRAC University faculty or any other suitable expert from universities and R/D organizations of the country to guide the project / thesis work. On completion of study and research s/he will have to submit the dissertation report and to face a viva board for the defence of the dissertation.

MAT 411: Topology

3 credits

Metric Spaces: Definition and some examples. Open sets. Closed sets. Convergence. Completeness. Baire's theorem. Continuous mappings. Spaces of continuous functions. Euclidean and unitary spaces. Topological Spaces: Definition and some examples. Elementary concepts. Open bases and open subbases. Weak topologies. Function algebras. Compactness: Compact spaces. Product spaces. Tychonoff's Theorem. Locally compact spaces. Compactness for metric spaces. Separation: T_1 -spaces and Hausdorff spaces. Completely regular spaces and normal spaces. Urysohn's lemma. Connectedness: Connected spaces. Locally connected spaces. Pathwise connectedness. Banach Spaces: Definition and some examples. Continuous linear transformations. Hahn-Banach theorem. Natural embedding. Open mapping theorem. Conjugate of an operator. Hilbert Spaces: Definition and some simple properties. Orthogonal complements. Orthogonal sets. Conjugate spaces. Adjoint and self-adjoint operators. Fixed point theory: Banach contraction principle. Schauder Principle. Applications. *Prerequisite: MAT 221*

MAT 415: Finite Element Methods

3 credits

Basic concept of finite element method, approximate solution of BVP, direct approach to Finite Element Methods. Galerkin's weighted residual method for one-dimensional BVP, the modified Galerkin's technique. Shape functions for one-dimensional elements. Division of a region into elements, linear and quadratic elements, numerical integration over elements. Finite element solution of one dimensional BVPs. Finite Element approximations of line and double integrals: line integral using quadratic elements, double integrals using triangular and quadrilateral elements, double integrals using curved elements. Finite Element solution of two-dimensional BVP: Galerkin formulation, matrix formulation for 2-D finite elements. Three-noded triangular elements. Variational formulation of BVP: construction of variational functions, the Ritz method and finite elements, matrix formulation of the Ritz procedure, solution of two-dimensional problems. Pre-processing and solution assembly: mesh generation in one and two dimensions, techniques of assembly and solutions. *Prerequisite: MAT312.*

MAT 416: Tensor Calculus

3 credits

Tensor: Coordinates, Vectors and tensors: Curvilinear coordinates, Kronecker delta, summation convention, space of N dimensions, Euclidean and Riemannian space, coordinate transformation,

Contravariant and covariant vectors, the tensor concept, symmetric and skewsymmetric tensor. Riemannian metric and metric tensors: Basis and reciprocal basis vectors, Euclidean metric in three dimensions, reciprocal or conjugate tensors, Conjugate metric tensor, associated vectors and tensor's length and angle between two vector's, The Christoffel symbols. Covariant Differentiation of Tensors and applications: Covariant derivatives and its higher rank tensor and covariant curvature tensor. *Prerequisite: MAT313*

MAT 421: Fluid Mechanics

3 credits

Preliminaries: Real and ideal fluids, Viscosity, Reynolds number, laminar and turbulent flows, boundary layers. Stress and rate of strain, General stress state of deformable bodies, General state of deformation of flowing fluid, Relation between stress and rate of deformation in general orthogonal coordinates. Equations of motion: Thermodynamic equation of state, Equation of continuity, Navier-Stokes equations, Energy equation, Equations of motion in different coordinate system. Exact solution of Navier-Stokes equations, Steady plane flow, Couette-Poiseuille flow, Plane stagnation-point flow, flow past parabolic body and circular cylinder, Steady axisymmetric flow, Circular pipe flow (Hagen-Poiseuille flow), Flow between two concentric rotating cylinders, Flow at a rotating disc, Unsteady plane flow, First Stokes problem, Second Stokes problem, Startup of Couette flow, Unsteady plane stagnation-point flow. Similarity analysis: Reynolds law of similarity, Dimensional analysis and theorem, Important non-dimensional quantities. Very slow motion: Equations of slow motion, Motion of a sphere in a viscous fluid, Theory of lubrication. Laminar boundary layer: Introduction to boundary layer, boundary layer equations in two dimensions, Dimensional representation of boundary layer equations, Displacement thickness, Friction drag, Flat plate boundary layer, Momentum thickness, Energy thickness, Similar solutions of boundary layer equations: Derivation of ODE, Wedge flow, Flow in a convergent channel, Integral relations of the boundary layer: Momentum-Integral equation, Energy-Integral equation. *Prerequisite: MAT 326*

MAT 422: Theory of Numbers

3 credits

Arithmetic in Z . Euclidean algorithm. Continued fractions. The ring Z^n and its group of units. Chinese Remainder Theorem. Linear Diophantine equations. Arithmetical functions. Dirichlet convolution. Multiplicative function. Representation by sum of two and four squares. Arithmetic of quadratic fields. Euclidean quadratic Fields.

**MAT 423: Mathematical Modelling
Modelling in Biology**

3 credits

Continuous population models for single species: Continuous growth models, Delay models, Periodic fluctuations, Harvesting models. Discrete population models for single species: Simple models, Cobwebbing, Discrete logistic models, Stability, Periodic fluctuations and Bifurcations, Discrete Delay models, Continuous models for interacting populations: Predator-prey models, Lotka-Volterra systems, Complexity and stability, Periodic behaviour, Competition Models, Mutualism. Discrete growth models for interacting populations: Predator-prey models. Epidemic models and dynamics of infectious diseases: Simple epidemic models and practical applications.

Modelling in Economics

Theory of the household: Preference and indifference relations, Utility function, Order conditions of optimization, Slutsky equation, Demand functions, Revealed Preference hypothesis, Von Neumann-Morgenstern utility. Theory of the firm: Production function, Laws of production and scale, Optimizing behaviour, Cost curves and cost functions, Constrained output maximization. Theory of factor demand: Optimal input mix, Factor demand and supply curves, Elasticity of derived demand. Market structures and equilibrium: Market Economy and equilibrium, Stability of equilibrium, Dynamic stability. *Prerequisite: MAT 322.*

MAT 424: Operations Research II

3 credits

Transportation and Assignment Problem: Introduction and formulation; relationship with linear programming. Network models: shortest route problems, minimal spanning, maximal-flow

problem. Sequencing problem: Minimax-maximin strategies, mixed strategies, expected pay-off, solution of $2 \times n$ and $m \times 2$ games, $m \times n$ games by linear programming and Brown's algorithm. Dynamic programming: Investment problem, Production Scheduling problem, Stagecoach problem, Equipment replacement problem. Non-linear programming: Introduction, unconstrained problem, Lagrange method for equality constraint problem, Kuhn-Tucker method for inequality constraint problem. Quadratic programming. *Prerequisite: MAT 316*

MAT 425: Advanced Numerical Methods

3 credits

Non-iterative (Newton's, steepest descent) methods for solution of a system of equation (linear and non-linear). Approximation theory: discrete least square applications, Chebyshev polynomial applications, rational function approximation, trigonometric polynomial approximation, Fast Fourier Transform. Approximating Eigenvalues: Housholder's method, QR algorithm. BVP involving ODE: shooting method for linear and nonlinear problems, finite difference method for linear and nonlinear problems. PDE: Finite difference methods for elliptic, parabolic and hyperbolic problems. *Prerequisite: MAT 312*

PHY 101: Introduction to Physics

3 Credits

Vectors and scalars, Newton's Laws of motion, inertia, force, momentum, conservation of linear momentum, work, energy, conservation of energy, power, gravitation, escape velocity, projectile motion, simple harmonic motion, uniform circular motion. Structural properties of matter, elasticity, Hooke's Law, viscosity, surface tension. Heat and temperature, different scales of temperature, thermal expansion, specific heat, gas laws, heat transfer. Waves and oscillations, longitudinal and transverse waves, sound waves, velocity of sound, ultrasonic waves & their applications. Reflection and refraction of light, mirrors and lenses, total internal reflection, interference, diffraction. Coulomb's Law, ohm's law; resistance, potential difference, capacitance. Magnetic force on a moving charge, electromagnetic spectrum, velocity of light. Atoms and nuclei, mass number and atomic number, isotopes, isobars & isotones, atomic theory, Planck's Law, Photo-electric effect, wave-particle duality, special theory of relativity, radioactive decay, nuclear fission & nuclear fusion, nuclear energy, fossil fuels & other sources of energy. Structure & vastness of the universe, big bang theory, light year, solar system, Kepler's Laws of planetary motion, cosmological principle, Hubble's Law, red shift, stellar energy, neutron stars, quasars, supernovae, pulsars, black holes.

PHY 102: Fundamentals of Physics

2 Credits

Vectors and scalars, Newton's Laws of motion, principles of conservation of linear momentum and energy, gravitation, projectile motion, simple harmonic motion, rotation of rigid bodies. Elasticity, Hooke's Law, viscosity, Stokes' Law, surface tension. Heat & temperature, specific heat, gas laws, Newton's Law of cooling, First and Second Laws of thermodynamics, kinetic theory of gases, heat transfer. Wave motion, stationary waves, sound waves, Doppler Effect, beats, acoustics, ultrasonic & applications. Huygens' principle, electromagnetic waves, reflection, refraction, interference, diffraction.

PHY 110: Mechanics and Properties of Matter

3 credits

Mechanics: Vectors & scalars, vector addition and subtraction, unit vectors, scalar and vector products, scalar & triple vector product, scalar and vector fields, gradient, divergence and curl, curvilinear co-ordinates, motion in one dimension, motion in a plane, work and energy, conservation laws, conservative force, projectile motion, uniform circular motion, simple harmonic motion, rotational motion, moment of inertia, radius of gyration, angular momentum, Kater's pendulum, Newton's Law of gravitation, gravitational field, potential, escape velocity.

Properties of Matter: Hooke's Law, elastic moduli, adhesive and cohesive forces, molecular theory of surface tension, capillarity, variation of surface tension with temperature. Streamline flow, Poiseuille's formula, streamline flow and turbulent flow, Reynold's Number, Equation of Continuity, Bernoulli's Theorem, Stokes' Law.

PHY 111: Principles of Physics I**3 Credits**

Vectors and scalars, unit vector, scalar and vector products, static equilibrium, Newton's Laws of motion, principles of conservation of linear momentum and energy, friction, elastic and inelastic collisions, projectile motion, uniform circular motion, centripetal force, simple harmonic motion, rotation of rigid bodies, angular momentum, torque, moment of inertia and examples, Newton's Law of gravitation, gravitational field, potential and potential energy. Structure of matter, stresses and strains, Moduli of elasticity Poisson's ratio, relations between elastic constants, work done in deforming a body, bending of beams, fluid motion and viscosity, Bernoulli's Theorem, Stokes' Law, surface tension and surface energy, pressure across a liquid surface, capillarity. Temperature and Zeroth Law of thermodynamics, temperature scales, isotherms, heat capacity and specific heat, Newton's Law of cooling, thermal expansion, First Law of thermodynamics, change of state, Second Law of thermodynamics, Carnot cycle, efficiency, kinetic theory of gases, heat transfer. Waves & their propagation, differential equation of wave motion, stationary waves, vibration in strings & columns, sound wave & its velocity, Doppler effect, beats, intensity & loudness, ultrasonics and its practical applications. Huygens' principle, electromagnetic waves, velocity of light, reflection, refraction, lenses, interference, diffraction, polarization.

PHY 112: Principles of Physics II**3 Credits**

Electric charge, Coulomb's Law, electric field & flux density, Gauss's Law, electric potential, capacitors, steady current, Ohm's law, Kirchhoff's Laws. Magnetic field, Biot-Savart Law, Ampere's Law, electromagnetic induction, Faraday's Law, Lenz's Law, self inductance and mutual inductance, alternating current, magnetic properties of matter, diamagnetism, paramagnetism and ferromagnetism. Maxwell's equations of electromagnetic waves, transmission along waveguides. Special theory of relativity, length contraction and time dilation, mass-energy relation. Quantum theory, Photoelectric effect, x-rays, Compton effect, dual nature of matter and radiation, Heisenberg uncertainty principle. Atomic model, Bohr's postulates, electron orbits and electron energy, Rutherford nuclear model, isotopes, isobars and isotones, radioactive decay, half-life, alpha, beta and gamma rays, nuclear binding energy, fission and fusion. Fundamentals of solid state physics, lasers, holography.

PHY 113: Waves, Oscillation & Acoustics**3 Credits**

Principle of superposition, interference of waves, phase velocity and group velocity, simple harmonic motion, combination of SHM, Lissajous figures, damped SHM, forced oscillation, resonance, power and intensity of wave motion, waves in elastic media, vibration of strings, beats, Doppler Effect, acoustics, stroboscopy, velocity of sound, ultrasonics, and their applications.

PHY 114: Thermal Physics & Radiation**3 Credits**

Heat and temperature, thermal equilibrium, Zeroth Law of thermodynamics, specific heat & calorimetry, Newton's Law of cooling, Kinetic Theory of Gases, idea of pressure due to collisions of molecules, mean free path, Boltzmann Distribution Law, Brownian motion, Law of equipartition of energy; Vander Waals' equation of state, heat transfer, conduction, convection and radiation, conduction of heat in solids, co-efficient of thermal conductivity and its measurement, First Law of thermodynamics, isothermal & adiabatic changes, reversible and irreversible processes, Carnot's cycle, efficiency of heat engines, Second Law of thermodynamics, entropy and disorder, absolute scale of temperature, thermodynamic functions, Maxwell's relations, Clausius-Clapeyron Equation, Gibb's phase rule, Third Law of thermodynamics, Nernst heat theorem, radiation theory, black body radiation, Wien's Law, Stefan-Boltzman Law, Rayleigh Jeans Law, Planck's Law, variation of specific heat with temperature, Einstein's theory, Debye's theory, conduction of heat in solids, measurement of conductivity, Joule-Thomson expansion, refrigeration, heat engines, Rankine cycles, cryogenics, measurement of high temperature.

PHY 115: Electricity and Magnetism**3 Credits**

Charge, quantization of charge, Coulomb's Law, electric field and potential. Gauss's Law, electric dipole, dielectrics, capacitance, energy of charged systems, electrical images, magnetic dipole,

energy in a magnetic field. Direct current and electromotive force, Ohm's Law, Kirchhoff's Laws, Wheatstone Bridge, Lorentz force, magnetic field of a current and Ampere's Law, Biot-Savart Law, electromagnetic induction, Faraday's Law, self-induction, mutual induction, alternating current, RMS value, power factor, CR, LR and LCR circuits, resonance.

PHY 201: Solid State Physics

3 Credits

Crystalline state, Bravais lattices, crystal symmetry, point group & space group, unit cells, Miller indices, x-ray diffraction, Bragg's Law, reciprocal lattice, structure factor, interatomic force and classification of solids, ionic, covalent, molecular, hydrogen bonded crystals, lattice energy of ionic crystals, Madelung constant, lattice vibration, phonons, normal modes in monatomic and diatomic linear chains, theory of specific heat, Einstein and Debye models, thermal expansion, defects in crystals, dislocations, consequences of defects on mechanical properties.

PHY 202: Optics

3 Credits

Laws of reflection and refraction, total internal reflection, Huygens' Principle, velocity of light, Young's experiment, Fresnel's bi-prism, Newton's rings, Michelson's interferometer, multiple reflections, Fabry-Perot interferometer, diffraction of light, Fresnel and Fraunhofer diffraction, single, double and multiple-slit diffraction, diffraction grating, spectrometer, resolving power of a grating, polarization of light, production of polarized light, plane, circular and elliptically polarized light, optical activity, double refraction, optic axis, half-wave and quarter-wave plate, nicol prism, dispersion of light, scattering of light, Thomson scattering.

PHY 204: Classical Mechanics and Special Theory of Relativity

3 Credits

Classical Mechanics: Newtonian equations of motion, conservation laws of a system of particles, variable mass, generalized co-ordinates, generalized force, D' Alembert's Principle, variational method, Euler-Lagrange equations of motion, Hamilton's principles, two-body central force problem, elliptic orbit, scattering in a central field, Rutherford formula, kinematics of rigid body motion, Euler angles, rotating co-ordinates, Coriolis force, wind motion, principal axis transformation, top motion, principle of least action, Hamiltonian equations of motion, small oscillations, normal co-ordinates, normal modes.

Special Theory of Relativity: Galilean relativity, Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformation, length contraction, time dilation, twin paradox, variation of mass, relativistic kinematics, mass energy relation.

PHY 205: Statistical Mechanics

3 Credits

Statistical Mechanics: Phase space, concept of state and ensemble, microcanonical, canonical and grand canonical ensembles, Boltzmann probability distribution, Maxwell velocity distribution, derivation of Bose-Einstein and Fermi-Dirac statistics, ideal Fermi gas, degenerate Fermi system, equation of state of ideal gases, ideal Bose gas, application of Statistical mechanics in various fields in physical, biological, social sciences, economics, finance and in engineering & ICT.

PHY 210: Quantum Physics of Atoms, Solids and Nuclei

3 Credits

Special Theory of Relativity: Michelson-Morley Experiment, Special Theory of Relativity, Lorentz Transformations, Time Dilation, Length Contraction, Mass-Energy Relation. Quantum Phenomena: Blackbody Radiation, Planck's Law, Photoelectric Effect, Bohr Atomic Model, Energy Levels & Atomic Spectra, Correspondence Principle, Dual Nature of Matter & Waves. Introductory Quantum Mechanics: Wave Function, Operators, Expectation Values, Schrödinger's Wave Equation, Particle in Box, Schrödinger Equation for Hydrogen Atom, Energy Levels, Magnetic & Orbital Angular Momentum, Concept of Quantum Numbers. Solid State Physics: Crystal Structure, Crystal Diffraction, Bragg Law, Lattice Vibrations & Phonons, Free Electron Model, Energy Levels & Density of States, Fermi-Dirac distribution function, Free Electron gas in Three dimension, Electrical conductivity & Thermal Conductivity, Hall Effect, Band Theory of Solids, Band Diagrams of Insulator, Semiconductor & Metals, Superconductivity, Lasers & Holography. Nuclear Physics:

Rutherford Nuclear Model, Radioactivity, Half life & Mean life, Nuclear Binding Energy, Fission & Fusion, Particle Accelerator, Elementary Particles & Nuclear Interactions, Quarks, Lepton & Hadrons, Big Bang & Origin of the Universe.

PHY 301: Classical Electrodynamics

3 Credits

Solution of Laplace's equation and Poisson's equation and applications to electrostatic problems, dielectrics, electrostatic energy, Maxwell's equations, electromagnetic waves, propagation of electromagnetic waves in conducting and non-conducting media, reflection and refraction, polarization, dispersion, scattering, waves in the presence of metallic boundaries, waveguides and resonators, solution of the inhomogeneous wave equations, simple radiating system, antennas, accelerated charge, Cerenkov radiation, elements of plasma physics. *Prerequisite PHY 115.*

PHY 302: Fluid Mechanics

3 Credits

Fluid properties, fluid statics, manometry, force on submerged planes and curved surface, buoyancy and floatation, one dimensional flow of fluid, equation of continuity, Euler's equation, flow of fluid in pipes, Bernoulli's equation, flow through orifice, mouthpiece, venturimeter, fundamental relations of compressible flow, frictional losses in pipes and fittings, types of fluid machinery, impulse and reaction turbines, centrifugal and axial flow pumps, deep well turbine pumps, specific speed, unit power, unit speed, unit discharge, performance and characteristics of turbines and pumps, design of pumps, reciprocating pumps. *Prerequisite PHY 110*

PHY 303: Quantum Mechanics

3 Credits

Breakdown of classical physics, quantum nature of radiation, Planck's Law, photoelectric effect, Einstein's photon concept and explanation of photoelectric effect, de Broglie wave, wave particle duality, electron diffraction, Davisson-Germer experiment, emergence of quantum mechanics, Schrodinger equation, basic postulates of quantum mechanics, physical interpretation of wave function, wave packets, Heisenberg's uncertainty principle, linear operators, Hermitian operators, eigenvalue equation, one-dimensional potential problem, harmonic oscillator, orbital angular momentum, rotation operator, spherical harmonics, spin angular momentum, addition of angular momenta, solution of the Schrodinger equation for hydrogen atom, matrix formulation of quantum mechanics.

PHY 304: Atomic & Molecular Physics

3 Credits

Rutherford scattering experiment, Discovery of the nucleus, Bohr quantization rules, hydrogen atom spectra, Franck-Hertz experiment, Sommerfeld-Wilson quantization rules, electron spin, Stern - Gerlach experiment, Pauli exclusion principle, electronic configuration of atoms, vector atom model, coupling schemes, Hund's rule, multiplet structure, fine structure in hydrogen spectral lines, Zeeman effect, Paschen-Beck effect, production of X-rays, measurement of X-ray wavelength, X-ray scattering, Compton Effect, Mosely's Law, molecular spectra, rotational and vibrational levels, Raman Effect and its applications, lasers.

PHY 305: Nuclear Physics I

3 Credits

Basic properties of nuclei, constituents of nuclei, nuclear mass, charge, size and density, nuclear force, spin, angular momentum, electric and magnetic moments, binding energy, separation energy, semi-empirical mass formula, radioactive decay law, transformation laws of successive changes, measurement of decay constant, artificial radioactivity, radioisotopes, theory of alpha decay, gamma radiation, energy measurement, pair spectrometer, classical treatment of gamma emission, internal conversion, Mossbauer Effect, beta decay, energy measurement, conservation of energy and momentum in beta decay, neutrino hypothesis, orbital electron capture, positron emission, interaction of radiation in matter, ionisation, multiple scattering, range determination, bremsstrahlung, pair production, annihilation. Discovery of neutrons, production and properties of neutrons, nuclear reactions, elastic and inelastic scattering, Q-value of a reaction and its measurements, nuclear cross-section, compound nucleus theory, direct reaction and kinematics. *Prerequisite PHY 304*

PHY 306: Basic Electronics**3 Credits**

Network theorems, filters, transmission line, basic semiconductor concepts, energy bands, electrons and holes, semiconductor diode, rectification, regulators, Zener diode, diode circuits, unijunction transistor, FET and its characteristics, transistor amplifier, FET amplifier; amplifier circuits, voltage amplifiers, RC coupled amplifiers and tuned amplifiers, frequency response, bandwidth, power amplifier, push-pull amplifier, feedback and amplifier stability, operational amplifier and its characteristics, oscillators, modulation and demodulation, digital electronics, digital logic, logic gates, Boolean algebra, logic circuits, information registers, flip-flop circuit.

PHY 308: Methods of Experimental Physics & Instrumentation**3 Credits**

Optical and spectroscopic instruments, defects of images and their remedies, optical blooming, phase contrast and polarizing microscope, spectrophotometers, optical transmittance, reflectance and absorption, application of interferometry, production and measurement of high and ultrahigh vacuum. Rotary pump, diffusion pump, ion pump and turbo pump, pirani, penning and ionisation gauges, measurement of current and voltages, potentiometer, VTVM, oscilloscope, D.C. amplifier, lock-in amplifier, frequency meter and counter, four point probe, flux meter and Hall probed transducers, piezoelectric, thermistor, photo-transducers, voltage regulator, SCR type temperature controllers. *Prerequisites PHY 202 and PHY 306*

PHY 309: Introduction to Materials Science**3 Credits**

Crystalline solids, amorphous, composite, fibrous materials, polymers, plastics, binding forces, elastic properties, dislocations, defects etc, specific heat, thermal expansion, thermal conductivity and electrical conductivity of metals, dielectric properties of solids, modes of dielectric polarisation, ferro electricity, piezo electricity, optical properties of solids, classical and semi classical theory, free carrier effects, lattice absorption, electronic absorption, magnetic properties of solid, atomic magnetic moments, dia and paramagnetism, ferro & ferrimagnetism, antiferromagnetism, ferrites, magnetic resonance, superconductivity, type-1, type -2 superconductors, liquid crystals. *Prerequisite PHY 201*

PHY 310: Advanced Solid State Physics**3 Credits**

Free electron theory, transport properties, Sommerfeld theory, Hall Effect, box quantization, density of states, Fermi surface, Fermi energy, electrical conductivity, WiedmannFranz law, band theory of solids, electron in a periodic potential, Schrödinger equation, Bloch function, LCAO and OPW methods, dielectric properties of insulators, Clausius-Mosotti relations, dielectric loss, relaxation time, polarization mechanism, direct & indirect band gap semiconductors, extrinsic semiconductors, charge carrier concentration, recombination process of p-n junction, superconductivity, Meissner Effect, London equation, BCS theory, introduction to high temperature superconductivity, magnetic materials, quantum theory of diamagnetism and paramagnetism, theory of ferromagnetic, ferrimagnetic and anti-ferromagnetic orders, magnetic resonance. *Prerequisite PHY 201*

PHY 311: X-Rays**3 Credits**

Continuous and Characteristic X-rays, Bremsstrahlung, Properties of X-rays, X-ray technique, Weissenberg and precession methods, identification of crystal structure from powder photograph and diffraction traces, Laue photograph for single crystal, geometrical and physical factors affecting X-ray intensities, analysis of amorphous solids and fibre textured crystal. *Prerequisite PHY 201*

PHY 312: Nuclear Physics II**3 Credits**

Determination of nuclear size by scattering methods and electromagnetic methods, mirror nuclei, electron scattering, nuclear shapes, electric and magnetic multiple moments, isotopic spin formalism, two-nucleon problem, nuclear forces, exchange force, meson theory of nuclear forces. Shell model, refinement of extreme single particle model, collective model, nuclear reactions, compound nucleus model, concept of optical potential, energy averaged cross section and the

optical model at low energies, phenomenological optical model, direct reactions, parity violation in beta decay, nuclear fission and nuclear reactor, nuclear fusion, nuclear liquid drop model & shell model, magic numbers (qualitative) accelerators, Van de Graaff generator, linear accelerator, cyclotron, synchrotron, detection of charged particles, photons and neutrons, nuclear pulse counting systems, elementary particles. *Prerequisite PHY 305*

PHY 313: Physics for Development

3 Credits

Twenty first century development issues, physics and break through technologies, ICT, fibre optics, quantum information theory, physics in genetics engineering and molecular biology, physics and health issues, bio and medical physics, materials science and physics, high temperature superconducting materials, space physics, microgravity experiments, econo-physics, physics principles applied in sociology.

PHY 400: Thesis / Project

4.5 Credits

A student is required to carry out thesis/project work in the 7th and 8th semester in a chosen field. There will be a supervisor who will either be a BRAC University faculty or any other suitable expert from universities and R/D organizations of the country to guide the thesis/ project work .On completion of study and research s/he will have to submit the dissertation paper and to face a viva board for the defence.

PHY 401: Reactor Physics

3 Credits

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 systems, neutron moderation, neutron diffusion, control of nuclear reactions, coolant, types of nuclear reactors: power reactor, research reactor, fast reactor, breeder reactor, reactor shielding, waste disposal. *Prerequisite PHY 305*

PHY 402: Atmospheric Physics

3 Credits

Structure of the atmosphere, elementary ideas about the sun and the laws of radiation, definitions and units of solar radiation, depletion of solar radiation in the atmosphere, terrestrial radiation, radiation transfer, heat balance in the atmosphere, heat budget, vertical temperature profile, radiation charts and their uses, composition of the atmosphere, mean molecular weight, humidity, mixing ratio, density and saturation vapour pressure. Fundamental equations of atmospheric motion, approximations of the equation, circulation and vorticity and their equations. Introduction to atmospheric thermodynamics.

PHY 403: Plasma & Astrophysics

3 Credits

General introduction to plasma physics, plasma as a fourth state of matter, definition, screening, and Debye shielding, plasma frequency, ideal plasma, temperature and pressure of plasma, magnetic pressure and plasma drifts, plasma waves, Landau damping, collisions in plasmas, hydrodynamic description of plasma, one fluid model, two fluid model, Chew-Goldberg theory, low waves in magneto-hydrodynamics, description of plasma, dielectric tensor, longitudinal and transverse waves, plasma instabilities, transport in plasmas, plasma kinetic theory, Vlasov equation, linear waves, waves in magnetized plasma, electromagnetic waves, waves in hot plasmas, nonlinear waves, Landau damping, quasi linear theory, plasmas in fusion research, astrophysical plasmas.

Introduction to astrophysics, formation of stars and galaxies, evolution of stars, the notion of cosmology, Cosmological Principle, various cosmological models of the universe, expansion of universe, Hubble's Law, problem of singularity in time, solutions of Friedmann, de Sitter and others, density of matter in the universe, cosmological term, self screening effect for matter. *Prerequisites PHY 301 and PHY 304*

PHY 404: Electronic Devices and Circuits**3 Credits**

Modelling and application of Semiconductor devices and integrated circuits, advanced transistor amplifier analysis, including feedback effects. Design for power amplifiers, operational amplifiers (OPAMP), analog filters, oscillators, A/D and D/A converters and power converters. Introduction to transistor level design of CMOS digital circuits. *Prerequisite PHY 306*

PHY 405: Mathematical Physics**3 Credits**

Series solution of 2nd order ordinary differential equations about ordinary and singular points, orthogonal set functions, Sturm-Liouville boundary value problem (SLP), eigen values and eigen functions of different SLP, series of orthogonal set of function. Laplace transforms: definition, Laplace transformations of some elementary functions, inverse Laplace transformations, Laplace transformations of derivatives, Dirac delta function, some special theorem on Laplace transformations, solution of differential equations by Laplace transformations, evaluation of improper integrals; finite Fourier series, Fourier transforms, Fourier integrals, Fourier transform and application to solution BVP, beta and gamma functions, Legendre functions, Bessel functions, solution of boundary value problem by method of separation of variables, solution PDE of mathematical physics: Helmholtz equation, wave equation: vibrating string, vibrating membrane, diffusion equation, Laplace equation, Hermite polynomials, Laguerre polynomials, hypergeometric functions. *Prerequisite MAT 203*

PHY 406: Medical Physics & Instrumentation**3 Credits**

Ultrasound imaging, A-scan, B-scan, M-scan, clinical applications, rectilinear scanner, gamma camera, CAT scanner, MRI, clinical applications, audiology, hearing aids, vascular measurements, blood pressure, blood flow, blood velocity, cardiac measurements; ECG, ECG planes, elementary ideas on heart disorders, defibrillators, pacemakers, neuromuscular measurements; EEG, EMG, **stimulation** of neural tissue, nerve conduction measurements, bio-electric amplifiers, patient safety, radiopharmaceuticals, radiotherapy, radiation protection, radiation dosimetry.

PHY 407: Mathematical Modelling in Physics**3 Credits**

Basic concept of mathematical modelling, formulation and solution, overview of computational methods of classical and quantum physics, numerical procedure for special functions, Random numbers generator, Brownian motion simulation, linear system of equations, sparse linear system, eigen value problems, BVP involving ODE, Sturm-Liouville problems, BVP involving PDE: elliptic, parabolic and hyperbolic problems using finite difference and other methods, Monte Carlo integration and simulation, mathematical modelling of problems of physics using above techniques. *Prerequisite MAT 205*

PHY 408: Advanced Quantum Mechanics**3 Credits**

Heisenberg and Dirac or interaction pictures, time-independent perturbation theory, degenerate perturbation theory, variation method, hydrogen atom and helium atom, WB approximation method, Sommerfeld-Wilson quantisation condition, time-dependent perturbation theory, Fermi's golden rule, applications, identical particles, parity, Pauli principle, applications, non-relativistic scattering theory, partial wave expansion, optical theorem, Smatrix, solution of the wave equation by the method of Green's function, LippmannSchwinger equation, Neumann series, Born approximation, applications, Klein-Gordon and Dirac equations, existence of electron spin, magnetic moment, plane wave solution of the Dirac equation, hole theory; prediction of the positron. *Prerequisite PHY 303*

PHY 409: Physics of Radiology**3 Credits**

The production and properties of X-rays, diagnostic and therapeutic 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 (MRI).

PHY 410: Laser Physics

3 Credits

Spontaneous and stimulated emission, absorption, pumping schemes, characteristic properties of laser beam, laser speckle, grain size calculation for free-space propagation, semi classical treatment of absorption and stimulated emission, spontaneous emission, results of QED treatment, electric dipole, allowed and forbidden transitions, Einstein's A and B coefficient, radiation trapping, superfluorescence, superradiance and amplified spontaneous emission, nonradiative decay, homogeneous and inhomogeneous broadening, linewidth calculations for naturally, collisionally and Doppler broadened line, two level and four, level saturation, saturation of absorption & inhomogeneously broadened line, passive optical resonators, continuous wave and transient laser behaviour, laser beam transformation, types of lasers, their construction and use, applications of lasers, optical communications, laser in fusion research, holography.
Prerequisite PHY 304

PHY 411: Geophysics

3 Credits

Solar system, the planets, meteorites, cosmic ray exposures of meteorites, Poynting-Robertson effect, compositions of the terrestrial planet, pre-radioactivity age problem, radioactive elements and the principle of radiometric dating, growth of constituents and of atmospheric argon, age of the earth and of meteorites, dating the nuclear synthesis, figure of the earth, precession of the equinoxes, the Chandler- wobble, tidal friction and the history of the earth moon system, fluctuation in rotation and excitation of the wobble, seismology of the earth, elastic wave and seismic rays, travel time and velocity depth curves for body waves, shockwave, internal pressure of earth core, internal density and composition, free oscillation, earthquake prediction problem, terrestrial magnetism, earth magnetic field, geophysical prospecting; seismic, gravitational, magnetic, electrical and nuclear methods.

PHY 412: Dynamical & Tropical Meteorology

3 Credits

Geophysical fluid dynamics, Navier-Stokes' equation, rotating and stratified flow, scale analysis, hydrostatic approximation, Coriolis force, geopotential etc., gradient and thermal wind, vorticity and circulation theorems, Proudmen-Taylor theorem, atmospheric wave, atmospheric turbulence, barotropic and baroclinic instabilities, numerical weather forecasting, quasi-geotropic approximation, barotropic vorticity equation, primitive equation, multilayered models, tropical cyclones, norwesters and tornadoes, the monsoons, dynamical climatology, physics of upper atmosphere: geomagnetism, neutral atmosphere, ionosphere and magnetosphere. *Prerequisite PHY 402*

PHY 413: General Theory of Relativity

3 Credits

Gravitation, Lagrangian Einstein equations, approximation of weak field and Hilbert's auxiliary conditions, comparison of corresponding relations with those of Newton's theory of gravitation, source of gravitation field, Schwarzschild's solution in isotropic and other coordinate systems, analogy between gravitation and electromagnetism, motion of test mass and geodetic lines, motion in Schwarzschild's field, equations of motion in general relativistic mechanics as a consequence of Einstein's equation of gravitational field, gravitational waves in weak field approximation, problem of energy transfer, exact wave solutions in the case of gravitational field, waves of matrices or wave of curvature, locally plane gravitational waves, Weber's and Braginski's experiments, prospects of future gravitational experiments.

PHY 414: Field Theory 3 Credits

Equation of motion, quantization, conservation laws, construction of Hilbert space, Lagrangian, equation of motion, quantization of neutral and charged Klein-Gordon fields, Dirac equation, spinors, quantization of Dirac field, Maxwell fields, Gupta-Bleuler formalism, theory of gauge fields, invariant functions propagators for Klein-Gordon field, Dirac fields and electromagnetic fields, symmetries of interactions, interaction picture; U and S matrices, Feynman diagrams,

Wick's theorem, Feynman rules, lowest order, amplitude and cross section for Compton scattering, GSW model of electroweak interactions, elements of QCD, path integral in field theory, introduction to string theory.

PHY 415: Neutron Scattering

3 Credits

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 Hove correlation formalism, some experimental results of scattering by liquids and molecules, small angle neutron scattering and its applications 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. *Prerequisite PHY 305*

PHY 416: Radiation Biophysics

3 Credits

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. *Prerequisite PHY 305*

STA 091: Basic Course in Statistics

0 credits

This course introduces statistical ideas as they apply to managers. Topics covered in the course include Collection, Organization and Presentation of data, Measures of central tendency, measures of dispersion, Skewness and Kurtosis, Correlation and Regression, Interpolation and Extrapolation, Time series analysis. Introduction to probabilities. Non-credit (equivalent to 3 credits). *Prerequisite: None*

STA 101: Introduction to Statistics

3 credits

Introduction to statistics, graphical displays, frequency distribution, mean, median, mode and other measures of central tendency, standard deviation and other measures of dispersion, measure of skewness and Whisker-Box plot, correlation and regression analysis, elementary probability theory, conditional and joint probability, sample survey, simple random sampling, stratified random sampling, systematic sampling, index number, time series and quality control.

STA 201: Elements of Statistics and Probability

3 credits

Frequency distribution, mean, median, mode and other measures of central tendency, standard deviation and other measures of dispersion, measure of skewness and Whisker-Box plot, correlation and regression analysis, elementary probability theory, conditional and joint probability, Bayes' theorem, discrete probability distributions, binomial, hypergeometric, Poisson, geometric and negative binomial distributions, continuous probability distributions, normal and exponential distributions, sampling distributions for relevant statistics (Normal, t, chi-square, and F distributions), central limit theorem, confidence intervals and hypothesis testing for parameter (mean and proportion).

STA 301: Modern Probability Theory & Stochastic Processes

3 Credits

Stochastic Processes: Definition of different types of stochastic processes, recurrent events, renewal equation, delayed recurrent events, number of occurrence of a recurrent event. Markov Chain: Transition matrix, higher transition probabilities, classification of sets and chains, ergodic properties. Finite Markov Chain: General theory of random walk with reflecting barriers, transient states, absorption probabilities, application of recurrence time, gambler's ruin problem.

Homogeneous Markov Processes: Poisson process, simple birth process, simple death process, simple birth death process, general birth process, effect of immigration, nonhomogeneous birth death process, Queuing theory. Modern Probability Theory: Probability of a set function, Borel field and extension of probability measure, probability measure notion of random variables, probability space, distribution functions, expectation and moments. *Prerequisite: STA201*

b. Practical Courses:

APE 104: APE Lab I

1.5 Credits

List of Experiments

- EXP 1: Determination of the Modulus of Rigidity of a Wire by the Method of Oscillations
- EXP 2: Determination of Surface Tension of Mercury and the Angle of Contact by Quincke's Method
- EXP 3: Determination of the Specific Heat of a Liquid by the Method of Cooling
- EXP 4: Determination of the Thermal Conductivity of a Bad Conductor by Lee's Method
- EXP 5: Determination of the Specific Resistance of a Wire using a Meter Bridge
- EXP 6: Determination of the High Resistance of a Suspended Coil Galvanometer by the Method of Deflection
- EXP 7: Determination of the Temperature Co-efficient of Resistance of the Material of a Wire
- EXP 8: Determination of the Line Frequency by Lissajous Figure using an Oscilloscope and a Function Generator and Verification of the Calibration of Time/Div Knob at a Particular Position for Different Frequencies
- EXP 9: Charging and Discharging of Capacitors and Study of Their Various Characteristics.
- EXP 10: Verification of Thevenin's and Norton's Theorem.
- EXP 11: Verification of Maximum Power Transfer Theorem.
- EXP 12: Verification of Current Division Rule (CDR), KVL and KCL
- EXP 13: Conversion of Galvanometer into Voltmeter.
- EXP 14: Conversion of Galvanometer into Ohmmeter.
- EXP 15: Determination of the e/m of Electron Using Helmholtz Coil.
- EXP 16: Determination of the Threshold Frequency for Photoelectric Effect of a Photo-Cathode and the Value of Planck's Constant by Using a Photoelectric Cell.

APE 206: APE Lab II

1.5 Credits

List of Experiments

- EXP 1: Determination of the Refractive Index of the Material of a Prism by using a Spectrometer.
- EXP 2: Determination of the Radius of Curvature of a Lens by Newton's Rings Method
- EXP 3: Determination of the Wavelengths of Various Spectral Lines by Spectrometer by using Plane Diffraction Grating
- EXP 4: Study of the Frequency Responses of Series and Parallel LRC Series Circuit and the Variation of Q-factor with Resistance.
- EXP 5: Study of the Variation of Electrical Conductivity of a Semiconductor and Determine of its Energy Gap.
- EXP 6: Study of the Characteristics of a PN Junction and Zener Diode.
- EXP 7: Study of the Characteristics of a NPN Bipolar Junction Transistor (BJT) in Common Base configuration.
- EXP 8: Study of the Characteristics of Junction Field Effect Transistor (JFET) in Common source configuration.
- EXP 9: Design and construction of a 4-diode Full Wave Rectifier power supply and study the effect of Shunt Capacitor filter.
- EXP 10: Implementation of AND, OR, NOT logic gates.

- EXP 11: Design of S-R flip-flop
- EXP 12: To design Code converters (Decimal-to-BCD, BCD-to-Decimal)
- EXP 13: To design Ripple, Ring and Decade Counters using JK-FFs.
- EXP 14: To study the characteristics of IC MUX, to realization of combinational circuits and generation of complex waveforms.
- EXP 15: Use of IC 74138 decoder as DEMUX, realization of 1-to-16 line DEMUX using 74138.

APE 301: APE Lab III**1.5 Credits****List of Experiments**

- EXP 1: Study of the characteristics of a Uni-junction Transistor.
- EXP 2: Study of the characteristics of a Silicon Controlled Rectifier Transistor.
- EXP 3: To draw and study the I-V characteristics of a solar cell.
- EXP 4: Design and construction of a BJT CE single-stage amplifier using potential divider biasing.
- EXP 5: Study the frequency response characteristics of a two stage RC coupled BJT amplifier.
- EXP 6: Study of the characteristics of 741 Operational Amplifier.
- EXP 7: Design of Inverting and Non-inverting amplifiers.
- EXP 8: Design and construction of active low pass and high pass filters using Op-Amps.
- EXP 9: Design and construction of active Butterworth Band pass filter.
- EXP 10: Design and construction of a Summing Amplifier using 741 Op-Amp.
- EXP 11: Study of the percentage distortion and power output of a complimentary symmetry push-pull power amplifier.
- EXP 12: Design and Construction of a Colpitts Oscillator.
- EXP 13: Design and Construction of Astable and Monostable Multivibrators using BJTs
- EXP 14: Expt with minority carrier.
- EXP 15: Design and Construction of a Crystal Oscillator.

APE 303: APE Lab IV**1.5 Credits****List of Experiments**

- EXP 1: Design and Construction of an Amplitude modulator and a demodulator.
- EXP 2: Design and Construction of a Frequency modulator and a demodulator.
- EXP 3: Design and Construction of a Phase-Shift-Keying and its detection.
- EXP 4: Design and Construction of a Pulse Amplitude modulation and its detection.
- EXP 5: Design and Construction of a Pulse Width modulation and its detection.
- EXP 6: Design and Construction of a Pulse Code modulation and its detection.
- EXP 7: To study Time Division Multiplex System
- EXP 8: Expt. with DSP (using DSP trainer)
- EXP 9: To measure microwave standing wave ratio.
- EXP 10: To measure microwave Frequency and Wavelength.
- EXP 11: Expt. with microwave antenna.
- EXP 12: Expt. with PLL.
- EXP 13: Expt. with Fiber-Optic Communication.
- EXP 14: To Study the TV Composite Video signal.
- EXP 15: Design, construction and testing of an Astable, Monostable and Voltage Controlled Oscillator using 555 Timer.
- EXP 16: Expt. with microprocessor (8086).

MAT 250: Mathematics Lab I**2 Credits**

Introduction to the computer algebra package MATHEMATICA/Matlab. Evaluation and graphical representation of function. Solution of linear and nonlinear equations by using False- Position, Bisection, Newton Raphson methods. Solution of system of linear equations by using Gaussian Elimination method. Interpolation and extrapolation. Numerical differentiations. Curve fitting. Trapezoidal and Simpson's rules for numerical integration. Problem solving in concurrent courses (e.g. Calculus, Linear Algebra and Geometry), using FORTRAN, MATHEMATICA and Matlab. Lab Assignments: There shall be at least 15 lab assignments

MAT 350: Mathematics Lab II

2 Credits

Solution of initial value or boundary value problems for Ordinary differential equations. Solution of initial value or boundary value problems for partial differential equations. Problem solving in concurrent courses (e.g; Calculus, Advanced linear algebra problems, Differential Equations and Numerical Analysis, Complex Analysis, Linear Programming, Numerical Analysis and Applied Mathematics) using FORTRAN and MATHEMATICA/Matlab. Lab Assignments: There shall be at least 15 lab assignments.

PHY 116 Physics Lab I

1.5 Credits

List of Experiments

- EXP 1: Determination of the Young's Modulus of a Short Wire by Searle's Dynamic Method
- EXP 2: Determination of the Modulus of Rigidity of a Wire by the Method of Oscillations
- EXP 3: Determination of g by means of a Compound Pendulum
- EXP 4: Determination of the Moment of Inertia of a Flywheel about its Axis of Rotation
- EXP 5: Determination of the Spring Constant and Effective Mass of a given Spiral Spring
- EXP 6: Determination of Surface Tension of Water by Capillary Tube Method
- EXP 7: Determination of Surface Tension of Mercury and the Angle of Contact by Quincke's Method
- EXP 8: Determination of the Viscosity of Glycerine by Applying Stokes' Law.
- EXP 9: Determination of the Specific Heat of a Liquid by the Method of Mixture
- EXP 10: Determination of the Specific Heat of a Liquid by the Method of Cooling
- EXP 11: Determination of the Thermal Conductivity of a Bad Conductor by Lee's Method
- EXP 12: Determination of the Pressure Co-efficient of a Gas at Constant Volume by Constant Volume Air Thermometer
- EXP 13: Determination of the Stefan's Constant
- EXP 14: Study of Variation of the Frequency of a Tuning Fork with the Length of a Sonometer (n-l curve) under given Tension and Hence to Determine the Unknown Frequency
- EXP 15: Determination of the Frequency of a Tuning Fork by Melde's Experiment
- EXP 16: Determination of Velocity of Sound by Kundt's Tube.

PHY 203: Physics Lab II

1.5 Credits

List of Experiments

- EXP 1: Determination of the Focal Length and Hence the Power of a Convex Lens by Displacement Method with the Help of an Optical Bench
- EXP 2: Determination of the Refractive Index of a Liquid by Plane Mirror and Pin Method using a Convex Lens
- EXP 3: Determination of the Radius of Curvature of a Lens by Newton's Rings Method
- EXP 4: Determination of the Refractive Index of the Material of a Prism by using a Spectrometer
- EXP 5: Determination of the Wavelengths of Various Spectral Lines by Spectrometer by using Plane Diffraction Grating
- EXP 6: Determination of the Value of an Unknown Resistance and Verification of the Laws of Series and Parallel Resistances by Means of a Post Office Box
- EXP 7: Determination of the Internal Resistance of a Cell by a Potentiometer
- EXP 8: Determination of the Specific Resistance of a Wire using a Meter Bridge
- EXP 9: Determination of the Resistance of a Galvanometer by the Half-Deflection Method
- EXP 10: Determination of the High Resistance of a Suspended Coil Galvanometer by the Method of Deflection
- EXP 11: Comparison of the EMF of Two Cells with a Potentiometer
- EXP 12: Determination of the Resistance per Unit Length of a Meter Bridge
- EXP 13: Determination of the Temperature Co-efficient of Resistance of the Material of a Wire
- EXP 14: Determination of the Value of J by Electrical Method
- EXP 15: Determination of the Line Frequency by Lissajous Figure using an Oscilloscope and a Function Generator and Verification of the Calibration of Time/Div Knob at a Particular Position for Different Frequencies
- EXP 16: Determination of the Self-Inductance of a Coil by Anderson's Method.
- EXP 17: Charging and Discharging of Capacitors and Study of Their Various Characteristics.

PHY 307: Physics Lab III**1.5 Credits****List of Experiments**

- EXP 1: Determination of the Excitation and Ionization Potentials (of mercury) by Frank-Hertz Experiment.
- EXP 2: Determination of the e/m of Electron Using Helmholtz Coil.
- EXP 3: Determination of the Threshold Frequency for Photoelectric Effect of a Photo-Cathode and the Value of Planck's Constant by Using a Photoelectric Cell.
- EXP 4: Determination of the Plateau of a Geiger-Muller Counter and Hence to Find its Operating voltage.
- EXP 5: Study of the Variation of Electrical Conductivity of a Semiconductor and Determine of its Energy Gap.
- EXP 6: Study of the Characteristics of a PN Junction and Zener Diode.
- EXP 7: Study of the Characteristics of PNP and NPN Transistors.
- EXP 8: Study of the Frequency Response Characteristics of an RC Low pass, RC High pass, a Band pass and a Parallel T Filter.
- EXP 9: Study of the Frequency Response in LRC Series Circuit and the Variation of Q-factor with Resistance.
- EXP 10: Determination of the Frequency Response in LRC Parallel Circuit and Determination of Q-factor.
- EXP 11: Study of Variation of Reactance due to L and C with Frequency.
- EXP 12: Designing and Construction a Summing Amplifier Using 741 Operation Amplifier (OPAMP).
- EXP 13: Construction of Full Wave Bridge Rectifier Using Semiconducting Diodes and Study of the Effect of Filters.
- EXP 14: Determination of Transistor Characteristics in Common Emitter Configuration and Determination of Hybrid Parameter.
- EXP 15: Determination of the Coefficient of Mutual Inductance Between Two Coils and Hence to Show its Variation with the Separation Between the Coils.
- EXP 16: Determination of the Absorption Coefficients of Different Materials for the Radiation Emitted by a Radioactive Source by Using a Geiger-Mueller Counter.

BRAC Business School

DESCRIPTION OF COURSES

BACHELOR OF BUSINESS ADMINISTRATION (BBA)

ACCOUNTING

ACT 201: Financial Accounting

3 credits

Accounting and its environments; Concepts and conventions of Accounting; Generally Accepted Accounting Principles; Accounting Equations; Recording business transactions; Accounting cycle; Accounting for a merchandising concern; Preparation of financial statements and Accounting for cash, receivables, inventories, fixed assets: acquisition, disposal and depreciation. Analyzing financial statements; implementing Accounting system: computerized Accounting. *Prerequisites: None*

ACT 202: Management Accounting

3 credits

Cost concepts; Classification; Job Order Costing; Process Costing; Cost behavior analysis; Cost-volume-profit analysis; Variable Costing; Activity Based Costing; Budgeting; Cost control and performance appraisal; Flexible Budgets and Overhead Analysis; Segment reporting, Profitability analysis and decentralization; Responsibility Accounting and variance analysis. *Prerequisites: Financial Accounting, ACT 201*

ACT 301: Intermediate Accounting

3 credits

The course deals with measurement and reporting of financial condition of business firms and with Accounting principles and process of different types of assets, liabilities and equities. Topics include environment of Accounting, generally Accepted Accounting principles, Accounting cycle, income measurement and reporting, financial reports, inventory valuation and Accounting, plant assets acquisition, depreciation and depletion, current liabilities, Accounting for shares, stock and debentures, Accounting for special issues like lease, income tax, pension, price changes and inflation and cash flows; Analysis of financial statements and Accounting changes, errors, and incomplete records. *Prerequisites: ACT 201, ACT 202, FIN 301, DEV 101*

ACT 422: Cost Accounting

3 credits

The course will cover Cost concept, classification and statements; Costing and control of materials; Costing and control of labors; Costing and control of manufacturing overhead; Service department cost allocation; Activity based costing; Job order cost system; Process costing-Weighted average and FIFO method, Accounting for spoilage; Joint product and by-product costing; Standard costing; Target costing, Theory of Constraints; Life cycle costing and strategic cost management; Quantity costing: Measurement and control; Marking cost analysis etc. *Prerequisites: ACT 201, ACT 202, DEV 101*

ACT 425: Principles of Auditing

3 credits

An introduction to auditing practice. Includes the social role of auditing and the services offered by auditors in internal, governmental, and public Accounting practice. Emphasis is on the financial auditing process, including professional ethics, audit risk assessment, study and evaluation of internal control, gathering and evaluating audit evidence, and audit reporting decisions. *Prerequisites: ACT 301*

ACT 423: Fundamentals of Taxation

3 credits

Topics include Income Tax: Definition of income and income tax, Characteristics of income, Total income and total world income, Income year and assessment year, Role of income tax law in industrial development of Bangladesh; Classification of income; Heads of income; Tax assessment and recovery assessment procedure; Income tax authorities; Assessment of individuals, partnership and public limited companies; Value Added Tax: Assessment and

payment of tax, Valuation, Accounting, Refunds, Drawback, Calculation of VAT, Controlling evasion of VAT. *Prerequisites: ACT 301, ACT 201, ACT 202, DEV 101*

ACT 421: Accounting Information Systems (AIS) 3 credits

The course covers Overview of Accounting information system; Organization and the Accounting system; Accounting information processing; Accounts system development; System analysis and acquisition; Computers and AIS; Software; Data communication; Database and file oriented systems; Control of AIS; Revenue cycle; Personnel cycle; Cash receipt and disbursement; Capital asset and financial statements. *Prerequisites: ACT 301, CSE 371, ACT 201, ACT 202, DEV 101*

ACT 431: Advanced Accounting 3 credits

The course deals with the conceptual framework of Accounting; Lease Accounting; Installment and hire-purchase, Single entry system; Consignment; Joint venture; Mergers, acquisitions and amalgamations; Insolvency Accounting; Accounting for VAT, tariffs, duties. *Prerequisites: ACT 301, ACT 201, ACT 202, DEV 101*

ACT 432: International Accounting: 3 credits

The globalization of markets, both financial and physical, has increased the importance of understanding the international dimensions of corporate Activities. The course will give students the opportunity to learn about diverse financial reporting practices and the reasons for such diversities as well as applying this knowledge in the context of the review and analysis of firm's performance by analysts, investors, and managers. At a corporate level, the course will also offer an appreciation of the significance of foreign exchange and of the tools and techniques for the management of its risks. *Prerequisites: ACT 301*

ACT 434: Accounting for Specialized Institutions 3 credits

The course will cover Accounting practice of specialized organizations such as banks, NGOs, Development Organizations, Government Agencies etc. *Prerequisites: ACT 301*

BUSINESS

BUS 101: Introduction to Business 3 credits

Basic principles and practices of contemporary business and its history; Forms of business organization and ownership; Environment of an enterprise; Organizing and managing the enterprise; Management of: HR, market productions and operations, finance; discuss a broad range of business situations where analysis and decision-making are required. Management tools and information systems; International and globalization; External environments of business; Future outlooks of business and business ethics. *Prerequisites: None*

BUS 201: Business and Human Communication 3 credits

This course aims to teach the theory and process of communication; including barriers to effective communication; communication skills; letters, memos and reports writing; oral communication; listening; use of visual aids in communication; and use of non-verbal communication, and effective business meeting behaviour. *Prerequisites: ENG 101, ENG 102*

BUS 202: Business Law 3 credits

A study of legal environment of business in Bangladesh, Includes both commercial and industrial laws. Law of Contract; Sale of Goods ACT; Law of Agencies; Bailment; Law of Carriage of Goods; Negotiable Instruments ACT, Law of Insurance; Company Law. Industrial ordinance. *Prerequisites: BUS 101*

BUS 203: Business Environment 3 credits

A study of economic, social, cultural, political, legal and technological factors affecting business in local, national and global context. Relationship between business and Government and between business and society are also examined. The focus of the course is on issues

management and identification of strategic options. The course involves learning tools and techniques for monitoring, identification and analysis of major environmental factors affecting business and assessing their impact on business decisions. *Prerequisites: BUS 101*

BUS 301: International Business **3 credits**

International business and environment; International trade theories; Introduction to international finance, economics and marketing; International communication and promotion; Mergers and acquisitions; International organizations and regulatory bodies. National and sub regional trade; bilateral and multilateral trade arrangements; Global business strategy and International law. *Prerequisites: ECO 101, ECO 102, FIN 301, MKT301, DEV 101*

BUS 302: Research Methods in Business and Management **3 credits**

Research and management; Scientific thinking; Research process and design; Measurement and scaling; Sampling design; Data collection methods; Survey instrument design; Field administration, Analysis and research communications. *Prerequisites: ECO 202, MAT 101, BUS 101, STA 101, ECO 101, ECO 102, ECO 201, DEV 101*

BUS 321: Principles of Entrepreneurship **3 credits**

Entrepreneurship and theory; Impact of environmental variables on entrepreneurial success; Informal sector; Opportunity identification and assessment; Formulating business, financial and marketing plans; entrepreneurial start-up strategies; Operating the business; Legal issues and Ethics and social responsibility of the entrepreneur. *Prerequisites: FIN 301, MKT 301, DEV 101*

BUS 421 Venture Development **3 credits**

The course aims at providing a theoretical framework for venture development and relates research works to the process and outcome of venture development so that the students can understand requirements for successful venture development. *Prerequisite: BUS 321*

BUS 422: Small Business Management **3 credits**

The course aims at providing knowledge of the requisites for successful management of small business. The course aims to develop the students' understanding of the economic, social and political environment within which the small business functions and to provide him with knowledge on how to avoid business failures & build up a highly profitable and growing enterprise. The course contains topics on role and characteristics of small business, planning and organizing procedure, business strategy, organizational, cultural, legal aspects. Production, marketing and financial management, Management of transition, growth and crisis. Information system and. control system. The course is designed to orient the student on the basic theoretical issues and practical aspects of small business and its development process. *Prerequisites: BUS 321*

BUS 423: Business Plan Development **3 credits**

The course is a project work based on field studies. The students are required to search and select a potential business idea, collect all pertinent data, conduct feasibility studies, formulate business and functional strategies and develop a full-fledged business plan. The business idea should be such that an entrepreneur can pursue it as a successful business venture immediately, The project work is conducted under the guidance of a supervisor and the students are required to present and defend the report. *Prerequisites: BUS 321*

FINANCE

FIN 301: Financial Management **3 credits**

This is the introductory course in finance and covers the basic tools and techniques of making financial decisions. Major topics include financial market and securities, financial statements and their analysis using financial ratios, time value of money, long-term investment analysis---

capital budgeting, cash flow estimation, project evaluation techniques under implicit and explicit risk conditions, basics of valuation and cost of capital; capital structure decisions, and optimal capital budget. *Prerequisites: ACT 201, MAT 101, DEV 101, BUS 101*

FIN 421: Corporate Finance-I:

3 credits

The course incorporates in-depth discussion of special topics in corporate finance. Topics include (1) risk and return with special emphasis on portfolio management, mean-variance analysis, and capital asset pricing model; (2) capital structure theory with particular emphasis on Modigliani-Miller theory with and without taxes and impact of financial distress, agency costs and asymmetric information, (3) Dividend policy and practice based on investors preference and dividend stability, (4) Bankruptcy, reorganisation, and liquidation. (5) Mergers and acquisition, and (6) Basics of international financial management. *Prerequisite: FIN 301, ECO 202, DEV 101*

FIN 422: Project Appraisals and Management

3 credits

The course deals with project identification, preparation, appraisal, management of implementation and post project evaluation. Basic techniques like network analysis, organization and control aspects of project implementation in relation to resources, time scale and information processing are emphasized. *Prerequisites: FIN 301.*

FIN 423: Securities Analysis and Portfolio Management:

3 credits

The course deals with the principles of investment in the securities and other asset markets. Major topics include securities markets, price performance of securities, industry analysis, basic stock valuation models, investment in special situations offering abnormal returns, bonds and fixed investment fundamentals, mutual funds, convertibles and warrants, real estate investment, precious metals, stones and collectibles, and management of investment portfolio. *Prerequisites: FIN 421, ACT 202, FIN 301, DEV 101*

FIN 424: Management of Financial Institutions

3 credits

Goals and strategies of financial institutions; roles and interrelationship of monetary authorities of Bangladesh and commercial banks; management of the central banking system; supervision of commercial banks; enforcement of minimum reserve requirement, control of money supply, credit policy and public debt management, problems of commercial banking with respect to lending, investment, deposit taking, cheque clearance, minimum reserve requirement and branch banking; issues relating to bank audit, operation of money, discount and government securities. Overview of structure and operations of major financial institutions in Bangladesh---BSB, BSRs, ICB, HBFC, Sonali Bank. *Prerequisite: FIN 301, ACT 202, DEV 101*

FIN 425: International Financial Management:

3 credits

The course is intended to introduce students to the overall environment of multinational corporations and challenges faced by MNCs in the changing scenario of globalisation. Major topics include exchange rate determination and international monetary system, balance of payment and international monetary linkage, the foreign exchange market, parity conditions and currency forecasting, managing exchange rate risk, multinational working capital management and short-term financing, foreign investment analysis foreign direct investment, and corporate strategy, investment analysis of multinational companies, international financing and international financial markets, international markets for stocks and bonds, the Euro dollar and euro bond markets. *Prerequisites: FIN 421, BUS 301, FIN 301, DEV 101*

FIN 427: Corporate Finance-II:

3 credits

This course will cover materials in financial planning and control, working capital management, sources of short-term and long-term financing including lease and hybrid financing. *Prerequisite: FIN 301, DEV 101*

FIN 431: Financial Derivatives**3 credits**

This specialisation course introduces students to basics of the operations of the derivatives markets. Topics include, (1) an overview of financial derivatives and, their uses and application, (2) Organisation of the forward and futures markets, forward and futures contract, pricing of futures using no-arbitrage bounds, convenience yield, expectation model of pricing futures, speculation and risk management with futures, term structure of futures prices and basis risk, volatility of futures prices. (3) The options contract, put vs. call options, European vs. American options, money nests, organisation of the options market; organisation of the options market, pricing of options, intrinsic value, premiums and discounts on options, determinants of options prices; options strategies; binomial options pricing model, Black-Scholes options pricing model. (4) The swap contract, the swap market, types of swaps; plain vanilla swaps, motivation for swaps, beyond plain vanilla swaps. *Prerequisites: FIN 421*

FIN 441: Bank Management and Electronic Banking:**3 credits**

The course deals with operational and statutory areas of commercial and specialised banking. Major topics include Evolution of banking institutions, functions of commercial banks and services rendered by them; general structure and methods of commercial banking, earning assets of banks. Functions of commercial banks---general banking, loan and equity banking, banking for facilitating international trade, banking costs and interest rates, mechanism of credit creation, analysing treasuries, banking systems in Bangladesh, statutory requirements of banks in Bangladesh as per the policies and procedures of Bangladesh Bank---the banking companies ACT and the Bangladesh banks nationalisation order. Electronic banking, its mechanism, its growing importance in banking operations. *Prerequisites: FIN 301, DEV 101*

FIN 450: Real Estate Finance:**3 credits**

The course focuses on various financial aspects of managing real estate organisation. Major topics include, (1) terminology legislation, principles, and analytical techniques pertaining to financing of real estate, (2) principles of real estate valuation, appraisal process and appraisal reports, (3) principles and practices of investment in real estate, investment strategy, ownership forms, tax implications, cash flow analysis, measures of return, risk management, and property selection. *Prerequisites: FIN 301*

FIN 461: Insurance and Risk Management**3 credits**

The course examines the management of non-speculative risks in the business enterprise with emphasis on insurance as a tool. Topics include concept of risk and insurance, risk analysis, treatment of risk control and financing, analysis of risk contracts in the areas of life, health, property and liability insurance. Overview of structure and operations of major insurance companies in Bangladesh---SBC, JBC, etc. *Prerequisites: FIN 301*

HUMAN RESOURCE MANAGEMENT**MGT 201: Organizational Behavior****3 credits**

Nature of Organizational Behavior; Individual behavior: personality, learning, and perceptions; Values and attitudes; Organizational stress: frustration, anxiety, and conflict; Motivation; Group behavior: basic concepts, roles, norms and status; Group dynamics; Communication; Power, politics and influence; Leadership; The organizational culture; Change and resistance to change and Group problem solving and decision making. *Prerequisites: BUS 101*

MGT 211: Principles of Management**3 credits**

Meaning and importance of Management; Evolution of Management thoughts; Managerial decision making; Environmental impact Accounting treatment of price level changes; on management; Corporate social responsibility, Planning; Setting objectives; Implementing plans; Organizing; Organization design, Managing change; Directing; Motivation; Leadership; Managing work groups; Controlling: principles, process and problems and Managers in changing environment. *Prerequisites: BUS 101*

MGT 301: Human Resource Management**3 credits**

Scope, role and function of Human Resource Management; Staffing the organization: human resource planning and forecasting, recruitment selection; Job design and analysis; Job evaluation; Performance management; Training and development; Disciplinary measures; Human resource audit and research; Forms of employee participation; Labor Relations; and Work Environment and Human resource management systems. *Prerequisites: MGT 211, MGT 201, DEV 101*

MGT 401 Business Strategy**3 credits**

Strategic thinking and strategic planning; Analyzing an industry; Developing strategic business plan; Assessment of organizational strength and weaknesses; Analysis of opportunities and threats; Scanning internal and external environment; Formulating functional, corporate and international level strategies; Evaluation of alternatives; Strategic decision making; Managing strategic changes and Strategic control. *Prerequisites: MGT 301, MKT 301, MSC 301, FIN 301, BUS 321, MGT 211*

MGT 421: Leadership: Theory and Practice**3 credits**

A study of the theory, principles and practices of leadership. Topics include basic human behavior pattern, leadership theories and styles, types of leadership, team building and team management. *Prerequisites: MGT 301*

MGT 422: Compensation Management**3 credits**

Process of developing a pay level and pay structure; Designing an effective pay systems; Types of pay systems; Administering a pay systems; Issues in administering a pay systems; Employee benefits, Perquisites, Benefit administration; Deferred compensation and Controlling benefit costs. *Prerequisites: MGT 301, DEV 101*

MGT 423: Training and Development**3 credits**

Learning and behavior; Teaching and training methods; Audio-visual aids; Programmed learning; Training and development function; Training strategy; Organizations of the training department; Training needs assessment; Designing training programs; Evaluation of training programs; Organizing conferences, workshops and study groups; Technical training; Training follow-up; Theory and practice of career development. *Prerequisites: MGT 301, MGT 201, MGT 211, DEV 101*

MGT 424: Industrial Relations**3 credits**

An overview of Industrial Relations; A profile of Bangladeshi Workers; Characteristics and Problems of Trade Unions in Bangladesh; A profile of Bangladeshi Employers; Functions of various bodies such as Bangladesh Employers' Association; Industrial Conflict; Collective Bargaining; Employee Discipline and Grievance Procedure; Participative Management and Industrial Democracy; ILO; Different Labour Laws of Bangladesh. *Prerequisites: MGT 301, MGT 201, MGT 211, DEV 101*

MGT 425: Manpower Planning and Forecasting**3 credits**

Forecasting Human Resource Requirements, Forecasting Human Resource Availability, Planning & Implementing Human Resources Programs to Balance Supply & Demand, Downsizing, Planning Model, The Nature of Human Resources Planning, Human Resources Planning Evaluation, Human Resource Information System, and System approach to annual manpower planning exercise. *Prerequisites: MGT 301, DEV 101*

MGT 426: Change Management**3 credits**

Fundamentals of change; Why Change Happens; Obstacles to Change; Planning for Change; Facilitating through change; Handling Resistance; Change Communications; Managing the New Beginnings Phase. *Prerequisites: MGT 301.*

MGT 427: Strategic Human Resource Management**3 credits**

Managing HRM; HRM functions in organizations; What is Strategic HRM? HR planning, recruitment and selection; Managing of Training and Development; Performance Management and Appraisal; Motivation; Compensation and Benefits; Employee Relations-Rights of Management and Workman; Worker issues such as grievance, absenteeism, probation, etc.; Legal Aspects of Employment in Bangladesh. *Prerequisites: MGT 301*

MGT 431: Industrial Psychology**3 credits**

Concept, importance and scope of Industrial Psychology, Individual and situational differences in behavior-causation of behavior, perception, learning, feelings and emotion, personality, perception, Employee selection, Personality and Interest factors, Employee evaluation, Employee training, Compensation and promotion of employees, Employee turnover, Absenteeism, Morale, Industrial Accidents, Safety and Fatigue, Industrial counseling. *Prerequisites: MGT 201, MGT 301, MGT 211, DEV 101*

MARKETING**MKT 201: Principles of Marketing****3 credits**

A survey course of the basic principles of marketing and key decision areas; product, promotion, distribution and pricing. *Prerequisites: BUS 101*

MKT 301: Marketing Management**3 credits**

Marketing philosophy and concept; Marketing environment; Consumer behavior process; Elements of marketing mix; Market segmentation and positioning; Pricing considerations; Promotion; Channel of distributions; Marketing ethics; Extended marketing and Relationship Marketing. *Prerequisites: MGT 201, MGT 211, DEV 101*

MKT 421: Introduction to Consumer Behavior**3 credits**

Consumer and Institutional buying behavior model; Classification of consumers; Learning and perception; Consumer adoption and diffusion process; Purchase behavior; Purchase decision process; influences of environmental factors; Classification of situation; Consumer movement and consumerism; Consumer and price; Alternative decision making; and Marketing and consumer behavior. *Prerequisites: MKT 301, MGT 201, DEV 101*

MKT 422: Selling and Salesmanship**3 credits**

Creative selling process; Sales planning and Managing field sales; Training and development of sales representatives; changing environment of sales management and Selling and promotion. *Prerequisites: MKT 301, DEV 101*

MKT 424: Advertising**3 credits**

Definition and functions of advertising; Classification of advertising; Economic impact; Advertising and the marketing mix; Message development, layout and copy writing; Advertising media and media planning; Outdoor advertising; Non-traditional advertisement; Advertisement agencies; Non-media advertising and Social, legal and ethical aspects of advertising. *Prerequisites: MKT 301*

MKT 425: International Marketing**3 credits**

Theories of international trade; International marketing environment; Modes of international trade; International market place; Entry strategy; International marketing research; Formulation of international marketing strategy: product, promotion, price, logistics and distribution; International marketing of services; International marketing organizations; Global linkages and domestic policy repercussions. *Prerequisites: MKT 301, DEV 101*

MKT 426: Basic Marketing Research**3 credits**

Definition; Scope and use of research; Types of research; Scientific methods; Type and source of information; Research methods; Methods of collecting data; Measurement and Designing

data collection instruments; Field operation; Data summarization; A (univariate, bivariate and multivariate) and interpretation of findings; Presentation of and Use of research findings.
Prerequisites: MKT 301, ECO 202, STA 101, DEV 101

MKT 427: Retailing **3 credits**
Retailing environment and its socio-economic importance; Retail organizations; Location analysis, planning and control; Store layout and design; Merchandising; Personal and non-personal selling; Pricing; Promotion management. Retail market audit; Trends in retailing; Standardization of retailing services. *Prerequisites: MKT 301*

MKT 428: Strategic Marketing **3 credits**
The course deals with formulation, implementation and control of marketing strategies and involves scanning of business environment with a focus on key marketing issues and an appraisal of the management of marketing functions. The course discusses marketing strategy, defining and analyzing markets, market segmentation, analyzing competition, market targeting and positioning strategies, marketing strategies for selected situations, planning for new products, product portfolio strategy, designing effective marketing organizations, marketing strategy implementation and control and other relevant topics. *Prerequisites: MKT 301.*

MKT 429: Business Logistics **3 credits**
Business Logistics: meaning and scope; Elements of logistics functions; Marketing forecasting; Order processing; Inventory planning and control, Traffic functions; Warehousing; Cost analysis; Impact of packaging; Service constraints and Customer services planning and control. *Prerequisites: MKT 301, ECO 201, ECO 202, DEV 101*

MKT 431: Services Marketing **3 credits**
Prepares students to be effective executives in a services economy; specific strategies for marketing intangible products and improving quality of service; nature and characteristics of services and the success factors in services marketing. *Prerequisites: MKT 301.*

MKT 432: Channel Marketing **3 credits**
Understanding of channels management, with a specific emphasis on one direct marketing technique, electronic commerce. Distribution fits into the total marketing picture, Use of distribution channels as a strategic tool, electronic commerce as a channel option. *Prerequisites: MKT 301.*

OPERATION MANAGEMENT

MSC 141: C Programming for Business: **3 credits**
C Programming for Business is geared for students with no programming experience. Sensibly organized, it explains concepts in a clear, understandable language supported by many fully worked out examples, highlights important definitions, concepts and rules. This course teaches the students how to install and configure a compiler, edit, compile and execute a program, handle user input and output, use arrays and structure, apply control flow structures etc. This course includes a compulsory laboratory work each week. *Prerequisites: CSE 101*

MSC 142: Visual Programming for Business: **3 credits**
Introduction to and use of Program Development, top down structured programming, step-wise refinement and program correctness are included in this course. The application of these programming techniques to form logical solutions to business data processing problems using a high level symbolic programming language is covered. Topics for this course are VB objects, VB events, data type, string operators, VB IDE, control frame, error handling, OOP with VB, windows common controls, GUI design, DLL, VBA, windows API, multimedia and multithreading. *Prerequisites: None*

MSC 301: Production-Operations Management**3 credits**

Introduction; Operations strategies; Forecasting; Manufacturing policy decisions; Production system; Plant location factory layout; Production planning and control; Product design & development; Job design; Work Study; Time and motion study; Materials management; Production and service scheduling; Quality control and inspection; Purchasing and inventory control and Maintenance management. *Prerequisites: MAT 101, ECO 202, MGT 211*

MSC 421: Productivity Management**3 credit**

Concept of productivity; Productivity in Manufacturing and Service Sector; Measurement of Productivity; Long vs. Short Term Productivity; Reasons for Low Productivity; Measure to Improve Productivity; Developing a Productivity Orientation in the Organization; Sectoral and National level Productivity and Productivity Movement. *Prerequisites: MSC 301, BUS 321*

MSC 422: Total Quality Management**3 credits**

Develops an understanding of quality concepts at all levels of business. Topics include: Meaning and Measurements of Quality; Concept of Total Quality Management; Management Approaches and Techniques For The Monitoring and Improvement of Product and Process Quality; Developing Standards for Quality of Product, Process and Service; Developing A Corporate Orientation For TQM. *Prerequisites: MSC 301*

MSC 423: Brand Management**3 credits**

Concept of branding; Advantages and implications of branding; Scope of brand management; Responsibility of a brand manager; Product portfolio analysis; Branding policy and strategy; New brand development; Price and Non-price competition; Distribution of brands and economics of branding. *Prerequisites: MKT 301*

MSC 424: Operations Research (Quantitative Methods for Decision Making) 3 credits

Basic operations research concepts and techniques for managerial decisions including linear programming, network problems, decision analysis, and computer implementation of these models to solve practical problems. *Prerequisites: MSC 301, BUS 302*

MSC 425: Materials Management**3 credits**

Concepts of Modern Material Management; The Store Functions; Storage Methods; Warehousing; Purchasing Management; Control of Quality and Supply Sourcing; Terms and Conditions of Purchase; Receiving, Inspection and Distribution; Budget Control; Production Control; Principal of Stock Controls; Interfaces of Physical Distribution Management. *Prerequisites: MSC 301*

MSC 427: Operations Planning and Control**3 credits**

An analysis of the planning and control of materials as they flow within an organization; topics include production planning, materials requirement planning (MRP), capacity management, master production scheduling and just-in-time techniques. *Prerequisites: MSC 301*

MSC 428: Managing Process Improvement**3 credits**

Examines process reengineering and quality management for manufacturing and service organizations. Topics covered include process flow and waiting line analysis, quality by design, service/quality guarantees, team problem solving tools, Malcolm Baldrige National Quality Award criteria and statistical process control. *Prerequisites: MSC 301*

MSC 429: Service Quality Management**3 credits**

Study of strategic and tactical issues concerning services in both service and manufacturing industries. Topics include: service process reengineering, performance measurements, service/quality standards and employee empowerment. *Prerequisites: MSC 301*

MSC 431: Operations Design and Logistics System**3 credits**

Managing systems of people and technology to create capabilities in operations. Emphasis is placed on new approaches to managing operations and logistics that promise strategic advantaged. *Prerequisites: MSC 301*

MSC 441: Introduction to Electronic Commerce**3 credits**

This is an introductory course that examines all facets of Internet commerce. Topics covered include creating and marketing products on the Internet, electronic money and third party use of the Internet for creating management information systems. *Prerequisite: CSE 371*

MSC442: Information Technology**3 credits**

History of computers and communication; IT in the modern world: its impact on individuals, organization, society; Hardware and Software for IT; Use of IT in business decisions; the future of IT: Social considerations, privacy, information overload, etc. *Prerequisites: CSE 371*

MSC 443: Applied Database Management**3 credits**

Objectives of database management; Sources of data; Data models; Database design; Data storage and access methods; Data base administration function; Data base system's life cycle; fourth generation programming languages, data integrity, security, and privacy. *Prerequisites: CSE 371*

MSC 444: Systems Analysis**3 credits**

Modern information systems; Systems concept; System Development life cycle; Structured methodologies; Systems analysis tools and techniques; Data flow diagram; Entity relationship diagram; Prototyping; Simulation techniques; Data dictionary; data collection techniques; Application of systems and models in practical problem solution. *Prerequisites: CSE 371*

MSC 445: Management of Information Systems**3 credits**

Use of computers in organization; Organizing and staffing the information system functions; Contingency Management & the MIS function; Planning and administration; control and evaluation; Technology trends and implications; Computer capacity planning; Managing systems Development; Hardware and Software acquisition. *Prerequisites: CSE 371*

MSC 446: Marketing on the Internet**3 credits**

This course examines the integration of the Internet in an organization's marketing strategy. Topics include, goals for online marketing, customer communications, interactive Internet pages, and customer service issues. *Prerequisite: CSE 371*

MSC 447: Technology Fundamentals of Electronic Commerce**3 credits**

This course examines the technological basis of electronic commerce. The computer-based network enabling electronic commerce is the focus. Data and voice networks, Internet and telephony, bandwidth, architecture, software strategies, the Internet and World Wide Web supplier industries will be discussed with relevance to e-commerce implementation planning. *Prerequisite: CSE 371*

MSC 448: Management of Online Business**3 credits**

A project course in which students prepare a proposal for launching a new product or service on the Internet that will include a complete strategy for an online business. *Prerequisite: CSE 371*

MSC 449: Business Data Communication**3 credits**

This course provides students with an understanding of business data communications from technical, managerial and applications perspectives to improve business performance. Topics include: The technical concepts of data communications and network designs and how they relate to contemporary computer end-user environments. The incorporation of the systems

approach for understanding, designing, managing, securing, and implementing data communication networks. Analyzing and designing data communication networks for various business situations. Communication Media. Network analysis tools and techniques. Data communication strategies. *Prerequisite: CSE 371*

MSC 451: Local Area Network Administration: 3 credits

In this course, students will receive a thorough overview of the installation, management, maintenance and utilities of local area networks. Topics include: An understanding of the responsibilities, tools, and technologies assigned to the Local Area Network administrator. Review of different network operating systems that meet the needs of small business, professional offices, workgroups and departments. Emphasis will be placed on operating systems that support simultaneous access from workstations while providing access to shared disk storage, memory, and interconnected LANs. *Prerequisite: CSE 371*

MSC 452: Distributed Information Systems for Business: 3 credits

The purpose of the course is to provide a basic understanding of distributed information systems. This course will enable students to understand how to select and manage data communication technologies that may be needed for creation of distributed information systems as well as for creating competitive advantage for the organization. Technologies covered are: Technological building blocks of today's telecommunication technologies; Local area networks; Long haul networks; Internet architecture; Client/server systems; Distributed databases. *Prerequisite: CSE 371*

MSC 452: E-Commerce Programming 3 credits

The course deals with technical aspects of e-commerce. Students will learn to design, build and maintain a complete e-commerce Web site. Topics include: E-Commerce modelling. Designing and implementing a Web site that meets user requirements. Maintaining and setting Web servers. Multi-tier Web architecture. Database servers. Accessing remote databases. Shopping cart fundamentals; Commerce server; Advertising on the Web. E-cash and electronic payments. Internet security and encryption. *Prerequisite: CSE 371*

MSC 454: Managing e-Commerce Projects 3 credits

This is an exciting, unique course that will focus on the principles of strategic management as applied to e-business. The course is designed to provide the students with a series of real-world tools that will assist in the analysis of various kinds of business problems and opportunities.

This course will teach the concepts of strategic management through readings and cases that simulate the decision-making problems that management professionals face. The basic objective is to introduce students to planning and strategy formulation concepts, and to the complex problems involved in managing a company in today's technological society. The course emphasizes the interrelationships of a firm's internal and external environment, and the careful crafting of strategy to solve current or future situations. Define what strategic management is. Understand strategy as applied by technology-based companies today. Apply analytical and critical thinking skills used in internal and external analysis. Effectively implement analytical tools such as SWOT, GAP, Porter's Five Forces model, or others, in the strategic planning process. Effectively prepare executive briefings related to analysis of a company's situation. *Prerequisite: CSE 371*

MSC 455: Java Programming for the Internet 3 credits

Intended for students in Arts, Business and Science interested in pursuing further courses in computer sciences. The course will cover algorithm design and programming techniques using Java with applications and applets related to real-world examples. An introduction to the World Wide Web and HTML included. *Prerequisite: CSE 371*

MSC 456: E-Commerce Infrastructure**3 credits**

Information Technology (IT) in a global business environment explores information systems and technology issues from a global perspective. This course focuses on the basic infrastructure required to conduct electronic commerce. The following topics will be discussed: Internet Technologies: Protocols, network structure, Access methods and routing. Data Network Support: ISDN, ADSL, fibre to home, broadband Access, ATM and frame relay. Software Methods: Mark-up languages, SGML, HTML, XML, objects, middleware and UML. Security: Encryption, digital signatures and public key infrastructure. Examples include SSL, SET and VeriSign. Payments: Invoicing, settlement, credit cards, clearance, industry players (Visa/Mastercard, banks, device providers), server-side encryption, automated cash gateway, SET standards and cash standards. Business Models: Business-to-business, business-to-consumer, business-to-administration, brokerage, seller-driven and buyer-driven markets and agents. m-Business: Why m-Business, wireless Access and short range wireless connectivity technologies. *Prerequisite: CSE 371*

MSC 457: E-Commerce Risk and Security Management**3 credits**

This course investigates the inherent insecurities of e-Commerce and approaches the risk and security management aspects. The following topics will be covered: Identifying the inherent insecurities of e-commerce. Risk management techniques to evaluate e-commerce risks and threats. Responding to threats through designing controls and security measures. Determining the boundaries of risk analysis. Securing digital products, services and information being transmitted across electronic networks. Ensuring confidentiality and integrity and establishing the authenticity of entities with which business is done. Reliability of third parties, such as Internet Service Providers (ISPs). Computer crime characteristics and techniques. Assuring continuation of Internet/e-Commerce facilities through disaster recovery procedures. *Prerequisite: CSE 371*

MSC 458: Cyber law**3 credits**

This course will cover the legal issues surrounding electronic commerce, multimedia and the Internet. Practical information as to how the business world is handling or should be handling key electronic issues such as intellectual property, including Web sites, domain names, privacy and consumer protection will also be discussed. Topics include: Introduction to Cyberspace and modes of regulating it. Jurisdiction over commercial Web sites. Jurisdiction as to tortious or criminal Acts on the Internet. Legal regulation of harmful speech in Cyberspace. Legal ramifications of filtering technologies. Spam. Legal protection of personal data on the Internet. Pros and cons of stronger privacy rules for Cyberspace. Legal regulations of encryption technologies. Cyber crimes. *Prerequisite: CSE 371*

MSC 459: Designing Web Usability**3 credits**

This course aims to provide an introduction to designing Web usability. The concepts introduced in this course will concentrate on dynamic content and on what the user sees, rather than how the content is generated. Topics include:

Common Problems in Web Design Planning a site; Cover site design; Page layout; Content design; Principles of Usability; Simple Usability Techniques; Designing Effective Navigation; Accessibility; Browser and Platform Issues; Using Browser Detection Scripts; Providing an introduction to general design principles and cognitive principles that are relevant to Web design. Issues of electronic document management will be discussed in the context of electronic business processes. *Prerequisite: CSE 371*

School of Engineering and Computer Science

The School of Engineering and Computer Science consists of the Department of Computer Science and Engineering (CSE) and the Department of Electrical and Electronic Engineering (EEE). Courses for BS in Computer Science, BS in Computer Science and Engineering, BS in Electronics and Communication Engineering, BS in Electrical and Electronic Engineering and other courses offered by the School of Engineering and Computer Science for different disciplines of BRAC University are described below:

Description of Courses from the Department of Computer Science and Engineering

CSE 101: Introduction to Computer Science **3 credits**

Introduction to the use of computer hardware and software as tools for solving problems. Automated input devices and output methods (including pre-printed stationary and turnaround documents) as part of the solution. Using personal computers as effective problem solving tools for the present and the future. Theory behind solving problems using common application software including word processing, spreadsheets, database management, and electronic communications. Problem solving using the Internet and the World Wide Web. Programming principles and use of macros to support the understanding of application software. The course includes a compulsory 3 hour laboratory work each week.

CSE 103: Introduction to Computing **1.5 credits**

Introduction to computers. Introduction to basic word processing and spreadsheet programs, internet and information access. HTML basic graphics, Software: Microsoft Word, Microsoft Excel, Notepad, Netscape Navigator, pint.

CSE 110: Programming Language I **3 credits**

This course would be an introduction to the foundations of computation and purpose of mechanized computation. Emphasis will be placed on techniques of problem analysis and the development of algorithms and programs. Topics will include: 1) Introduction to digital computers and programming algorithms and flow chart construction. 2) Information representation in digital computers. Writing, debugging and running programs (including file handling) on various digital computers using an appropriate language. 3) Data structures, abstraction, recursion, iteration, as well as the design and analysis of basic algorithms.

The course includes a compulsory 3 hour laboratory work each week. Students will be expected to do homework assignments in problem solving and program design as well as weekly laboratory assignments to reinforce the lecture material.

CSE 111: Programming Language-II **3 credits**

This course would be an introduction to data structures, formal specification of syntax, elements of language theory and mathematical preliminaries. Other topics that would be covered are formal languages, structured programming concepts, survey of features of existing high level languages. Students would design and write application using an appropriate language. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite CSE 110*

CSE 161: Computer Programming **3 credits**

This course would be an introduction to the foundations of computation and purpose of mechanized computation. Emphasis will be placed on techniques of problem analysis and the development of algorithms and programs. Topics will include: 1) Introduction to digital computers and programming algorithms and flow chart construction. 2) Information representation in digital computers. Writing, debugging and running programs (including file handling) on various digital computers using an appropriate language. 3) Data structures, abstraction, recursion, iteration, as well as the design and analysis of basic algorithms.

Students will be expected to do homework assignments in problem solving and program design to reinforce the lecture material.

CSE 162: Computer Programming Laboratory **1 credit, 2 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in CSE 161 and will learn program design and coding.

CSE 163: Computer Programming II **3 credits**

This course would be an introduction to data structures, formal specification of syntax, elements of language theory and mathematical preliminaries. Other topics that would be covered are formal languages, structured programming concepts, survey of features of existing high level languages. Students would design and write application using an appropriate language. *Prerequisites: CSE 161, CSE 162*

CSE 164: Computer Programming II Laboratory **1 credit, 2 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in CSE 163 and will learn program design and coding.

CSE 220: Data Structures **3 credits**

Introduction to widely used and effective methods of data organization, focusing on data structures, their algorithms and the performance of these algorithms. Concepts and examples, elementary data objects, elementary data structures, arrays, lists, stacks, queues, graphs, trees, compound structures, data abstraction and primitive operations on these structures. memory management; sorting and searching; hash techniques; Introduction to the fundamental algorithms and data structures: recursion, backtrack search, lists, stacks, queues, trees, operation on sets, priority queues, graph dictionary. Introduction to the analysis of algorithms to process the basic structures. A brief introduction to database systems and the analysis of data structure performance and use in these systems. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite CSE 111*

CSE 221: Algorithms **3 credits**

The study of efficient algorithms and effective algorithm design techniques. Techniques for analysis of algorithms, Methods for the design of efficient algorithms :Divide and Conquer paradigm, Greedy method, Dynamic programming, Backtracking, Basic search and traversal techniques, Graph algorithms, Elementary parallel algorithms, Algebraic simplification and transformations, Lower bound theory, NP-hard and NP-complete problems. Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. sorting; Data structures for sets: Heaps, Hashing; Graph algorithms: Shortest paths, Depth-first search, Network flow, Computational geometry; Integer arithmetic: gcd, primality; polynomial and matrix calculations; amortised analysis; Performance bounds, asymptotic and analysis, worst case and average case behavior, correctness and complexity. Particular classes of algorithms such as sorting and searching are studied in detail. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite CSE 220*

CSE 230: Discrete Mathematics **3 credits**

Set theory, Elementary number theory, Graph theory, Paths and trees, Boolean Algebra, Binary Relations, Functions, Algebraic system, Generating functions, Induction, Reduction, Semigroup, Permutation groups, Discrete Probability, Mathematical logic, Prepositional calculus and Predicate calculus.

CSE 250: Circuits and Electronics **3 credits**

Fundamental electrical concepts and measuring units. Direct current: voltage, current, resistance and power. Laws of electrical circuits and methods of network analysis; Introduction to magnetic circuits. Alternating current: instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C circuits, phasor representation of sinusoidal quantities. The

course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite: PHY 111 or appropriate experience in electronic circuits*

CSE 251 Electronic Devices and Circuits

3 credits

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode. Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, h parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier. Field Effect Transistors (FET): principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS. Operational Amplifiers (OPAMP) : linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise. Introduction to feedback, Oscillators, Silicon Controlled Rectifiers (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite: CSE 250*

CSE 260: Digital Logic Design

3 credits

An introduction to digital systems such as computer, communication and information systems. Topics covered include Boolean algebra, digital logic gates, combinational logic circuits, decoders, encoders, multiplexers. Asynchronous and synchronous counters. Registers, flip-flops, adders, Sequential circuit analysis and design. Simple computer architecture. The course includes a compulsory 3 hour laboratory work each week.

CSE 310: Object Oriented Programming

3 credits

An introduction to object oriented programming using. Java is the language typically used to illustrate the concepts, but another suitable language may be substituted by the instructor. Topics covered include object instances, classes, inheritance, polymorphism and abstraction mechanism. Problem domain analysis and system design using object oriented approach. Object oriented database and object persistency. Software principles for object oriented approach. Advantages and problems with using object oriented approach to developing systems. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite: CSE 111*

CSE 320: Data Communications

3 credits

Introduction to purpose and methods of communication. Necessity for modulation and techniques. Technical aspects of data communications. Effects of noise and control. Basic concepts such as fundamental limits, encoding, modulation, multiplexing, error detection and control. Topics include: Data Transmission Protocols, different layers in data communication systems, LANs, WANs linked with telephony. This course will include a compulsory 3-hour laboratory work each week for those interested in obtaining the CCNA certification.

CSE 321: Operating Systems

3 credits

Principles of operating systems: design objects; sequential process; concurrent processes, functional mutual exclusion, processor co-operation and deadlocks, management. Control and scheduling of large information processing systems. Dispatching processor access methods, job control languages memory addressing, paging and store multiplexing, and time sharing, batch processing. Scheduling algorithms, file systems, and security; semaphores and critical sections, device drivers, multiprocessing, sharing, design and implementation methodology, performance evaluation and case studies. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite: CSE 221*

CSE 330: Numerical Methods

3 credits

Computer Arithmetic: floating point representation of numbers, arithmetic operations with normalized floating point numbers; Iterative methods: different iterative methods for finding the

roots of an equation and their computer implementation; Solution of simultaneous Algebraic Equations, Gauss elimination; Interpolation, Least square approximation of functions, Taylor series representation, Chebyshev series; Numerical differentiation and integration and Numerical Solution of Differential Equations. *Prerequisite: MAT 120, MAT 215*

CSE 331: Automata and Computability

3 credits

An introduction to finite representation of infinite objects and basic mathematical models of computation. Finite automata and regular languages, pushdown automata and context free languages. Turing machines. Church's Thesis. Partial recursive functions. Undecidability. Reducibility and completeness. Halting problem. Time complexity and NP-completeness. Probabilistic computation. Interactive proof systems. *Prerequisite: CSE 221*

CSE 340: Computer Architecture

3 credits

A systematic study of the various elements in computer design, including circuit design, storage mechanisms, addressing schemes, and various approaches to parallelism and distributed logic. Information representation and transfer; instruction and data access methods; the control unit; hardware and microprogrammed; memory organisation. RISC and CSEC machines. *Prerequisite CSE 260 or EEE 301, EEE 302*

CSE 341: Microprocessors

3 credits

Introduction to different types of microprocessors. Microprocessor architecture, instruction set, interfacing/O operation, interrupt structure, DMA. Microprocessor interface ICs. Advanced microprocessor concept of microprocessor based system design. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite: CSE 260*

CSE 342: Computer System Engineering

3 credits

Topics on the engineering of computer software and hardware systems: techniques for controlling complexity; networks and distributed systems; atomicity and coordination of parallel activities; recovery and reliability; privacy of information; impact of computer systems on society. Case studies of working systems and outside reading in the current literature provide comparisons and contrasts.

CSE 350: Digital Electronics and Pulse Techniques

3 Credits

Diode logic gates, transistor switches, transistor gates, MOS gates, Logic families: TTL, ECL, IIL and CMOS logic with operation details. Propagation delay, product and noise immunity. Open collector and High impedance gates. Electronic circuits for flip flops, counters and register, memory systems. PLA's (A/D, D/A converters with applications, S/H circuits) LED, LCD and optically coupled oscillators. Non-linear applications of OPAMPs. Analog switches. Linear wave shaping: diode wave shaping techniques, clipping and clamping circuits, comparator circuits, switching circuits. Pulse transformers, pulse transmission. Pulse generation: monostable, bistable and stable multivibrations, Timing circuits. Simple voltage sweeps, linear circuit sweeps. Schmitt trigger, blocking oscillators and time base circuit. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite: CSE 251, CSE 260*

CSE 360: Computer Interfacing

3 credits

Interface components and their characteristics, micro processor I/O. Disk, Drums and Printers. Optical displays and sensors. High power interface devices, transducers, stepper motors and peripheral devices. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite CSE 341*

CSE 370: Database Systems

3 credits

Introduction to concepts and methods for storing and manipulating data in stored form. File retrieval and organization. Database models and designing of database systems. The principles of database management systems. Relational database management systems. Query formulation and language. Database administration. Methods used for the storage, selection and presentation

of Data. Database integrity and security. Students will work with database languages and popular application packages. Common database management systems. Structure of SQL and principals behind the design of SQL. Students must complete four SQL assignments in the lab. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite CSE 221*

CSE 371: Management Information Systems

3 Credits

Computer & information processing; Strategic information systems; Software, hardware and telecommunications; System building methods; Transaction processing system; Office automation; DeCSEion support systems; Executive support systems; Artificial intelligence; Computer security & disaster planning; Ethical & social issues in information systems.

CSE 390: Technical Communication

3 Credits

The fundamentals of technical communication using oral, written and visual means are presented as practiced in industry and academia. Clarity of thought, organizational skills and systematic approaches are emphasized. Students engage in exercises that focus on technical writing, public speaking, graphic design and giving presentations. They apply their skills across a broad range of activities, including critique of presentations and writing of proposals, reports, memoranda, user manuals, instructional modules, and technical specifications. Techniques presented are intended to create an appreciation for format and content and to better prepare students for project documentation and formal presentations. *Prerequisite: Permission of instructor*

CSE 391: Programming for the Internet

3 Credits

A survey of current Internet technologies and state-of-the-art web programming methods. Using client/server structures, topics studied will be drawn from JavaScript, JSP, ASP, Cold Fusion, Flash, Document Object Model, HTML, Cascading Style Sheets, XML, CGI, TCP/IP and the .NET platform. Programming tools may include PERL, various UNIX shell scripts, Windows batch files, Java and other languages as needed. *Prerequisite: CSE 220*

CSE 392: Signals and Systems

3 Credits

The course deals with the topics of Fourier series, Fourier transforms, Laplace transform, time and frequency response, ideal low-pass filters, band-pass channels, analogue communications, amplitude modulation, angle modulation, frequency-division multiplexing, digital communications, pulse-code modulation, time-division multiplexing, random processes, stationarity, autocorrelation functions, spectral density, Gaussian processes, noise in analogue and digital modulation schemes. *Prerequisite: MAT 215*

CSE 410: Advanced Programming In UNIX

3 Credits

Exploration of the Unix operating system, including its tools and utilities for program development, such as makefile, piping and redirection, shell scripts, regular expressions, and symbolic debuggers. In addition, this course explores advanced features of the C programming language, including various file processing, command-line and variable arguments, exception handling, and generic interfacing. Multiprocessing and Multithreading programming in Unix/Linux C. Thread synchronization. Network programming and TCP/IP socket programming. The course includes a compulsory 3 hour laboratory work each week. *Pre req CSE 321*

CSE 419: Programming Languages

3 credits

An introduction to the principles of functional, imperative, and logic programming languages. Topics covered include meta-circular interpreters, semantics (operational and denotational), type systems (polymorphism, inference, and abstract types), object-oriented programming, modules, and multiprocessing; case studies of contemporary programming languages. Programming experience and background in language implementation required. *Prerequisite: CSE 111, and CSE 331 or permission of the instructor*

CSE 420: Compiler Design

3 credits

Theory and Practice; An introduction to compiler and interpreter design, with emphasis on

practical solutions using compiler writing tools such as Yacc in UNIX, and the C programming language, Topics covered include: lexical scanners, context free languages and pushdown automata, recursive descent parsing, bottom up parsing, attributed grammars, symbol table design, run time memory allocation, machine language, code generation and optimization. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite: CSE 221, and CSE 331 or permission of the instructor*

CSE 421: Computer Networks

3 credits

An introduction to the basics of transport connections and sessions. The protocol hierarchy, design issues in transport and session layer protocol, end-to-end protocols, message handling protocols, terminal and file transfer protocols, Internet TCP/IP protocols. End to end data networks, congestion control networks, wireless networks, mobile computing, high speed networks. Concurrent programming, data link layer, framing and error control, media access control. Models of distributed computation, management and resource control of networks and distributed operating systems, distributed file systems, caching scheduling, process migration. Fault tolerance, network security and privacy, algorithm for deadlock detection. Synchronization and concurrency control in distributed systems. The course includes a compulsory 3-hour laboratory work each week if the student wishes to obtain CCNA certification. Otherwise the course includes a compulsory 3-hour laboratory work alternate week. *Prerequisite CSE 320 for CCNA certification*

CSE 422: Artificial Intelligence

3 credits

Survey of concepts in artificial intelligence. Knowledge representation, search and Control techniques. AI machines and features of LISP and PROLOG languages. Problem Representation; search, constraint propagation, rule chaining, frame inheritance, inference and learning in intelligent systems; systems for general problems solving, game playing, expert consultation, concept formation and natural languages processing; recognition, understanding and translation. Use of heuristic vs. algorithmic programming; cognitive simulations - vs. machine intelligence; study of some expert systems such as robotics and understanding. Solving problems in AI languages. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite CSE 221*

CSE 423: Computer Graphics

3 credits

Introduction to Graphical data processing. Fundamentals of interactive graphics Architecture of display devices and connectivity to a computer. Implementation of graphics concepts of two dimensional and three dimensional viewing, clipping and transformations. Hidden line algorithms. Raster graphics concepts: Architecture, algorithms and other image synthesis methods. Design of interactive graphic conversations. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite MAT 215*

CSE 424: Pattern Recognition

3 credits

Introduction to pattern recognition: features, classifications, learning. Statistical methods, structural methods and hybrid method. Applications to speech recognition, remote sensing and biomedical area. Learning algorithms, Syntactic approach: Introduction to pattern grammars and languages. Parsing techniques. Pattern recognition in computer aided design. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite MAT 215*

CSE 425: Neural Networks

3 credits

An extensive course on neural network architectures and learning algorithms with theory and applications. Temporal and optimal linear associative memories, fuzzy control. Cohen-Grossberg theorem. Unsupervised learning. Higher-order competitive, differential Hebbian learning networks. Supervised learning. Adaptive estimation and stochastic approximation. Adaptive vector quantization, mean-square approach. Kohonen self-organizing maps. Grossberg theory. Simulated annealing. Boltzman and Cauchy learning. Adaptive resonance. Gabor functions and networks.

CSE 426: Basic Graphs Theory**3 credits**

Graphs and simple graphs, diagraphs, subgraphs, vertex-degrees, walks,, paths and cycles; trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, Chromatic polynomials, chromatic index, Vizing's theorem, planar graphs, perfect graphs.

CSE 427: Machine Learning**3 credits**

Introduction to machine learning; Supervised and reinforcement learning; Unsupervised learning algorithms; Attribute based and relational supervised learning algorithms; Neural network based learning algorithms; Genetic algorithm and genetic programming; Reinforcement learning algorithms; Computational learning theory.

CSE 428: Image Processing**3 credits**

Digital image fundamentals, perception, representation; image transforms; First Fourier Transform (FFT), Discrete Cosine Transform (DCT), Karhunen and Loeve Transform (KLT), Wavelet transform and sub-band decomposition; image enhancement and restoration techniques, image compression techniques, image compression standards: JPEG, MPEG, H.261, and H.263.

CSE 429: Basic Multimedia Theory**3 credits**

Multimedia System- Introduction; Coding of compression standards; Architecture issues in multimedia; Operating System issues in multimedia- real-time OS issues, synchronization, interrupt handling; Database issues in multimedia- indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia- Quality-of service guarantees, resource reservation, traffic specification, happing and monitoring, admission control; Security issues in multimedia- digital water-marking, partial encryption schemes for video streams; Multimedia application- audio and video conferencing, video on demand, voice over IP. Concepts covered in lecture applied in computer laboratory assignments.

CSE 430: Digital Signal Processing**3 credits**

Introduction to Digital Signal Processing, Filtering, Frequency response, Sampling theory, Z-transform, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Windowing, Correlation & Convolution, Application of Digital Signal Processing. Introduction to Digital Filters, Finite Impulse Response (FIR), Infinite Impulse Response (IIR), Different techniques of FIR and IIR filter design. MATLAB application to DSP; the course includes a compulsory 3-hour laboratory work each week. *Prerequisite CSE 111 and MAT120*

CSE 431: Natural Language Processing**3 credits**

Introduction to the field of natural language processing (NLP)- the creation of computer programs that can understand, generate, and learn natural language. The topics include the three major subfields of NLP: syntax (the structure of an utterance), semantics (the truth-functional meaning of an untturance), and pragmatics/discourse (the context-dependent meaning of an utterance). The course will introduce both knowledge-based and statistical methods for NLP, and will illustrate the use of such methods in a variety of text- and speech-based application areas. *Prerequisite CSE 111, and CSE 422 or consent of the instructor*

CSE 432: Speech Recognition and Synthesis**3 credits**

Introduction to automatic speech recognition, speech understanding and speech synthesis/text-to-speech from the computer science and linguistics perspective. Focus on understanding of key algorithms including noisy channel model, Hidden Markov Models (HMMs), A* and Viterbi decoding, N-gram language modeling, unit selection synthesis, and roles of linguistic knowledge (especially phonetics, intonation, pronunciation variation, disfluencies). *Prerequisite CSE 111 or CSE 163, CSE 164*

CSE 460: VLSI Design**3 credits**

Design and analysis techniques for VLSI circuits. Design reliable VLSI circuits, noise considerations, design and operation of large fan out and fan in circuits, clocking methodologies, techniques for data path and data control design. Simulation techniques. Parallel processing, spatial purpose architectures in VLSI. VLSI layouts partitioning and placement routing and wiring in VLSI. Reliability aspects of VLSI design. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite CSE 350*

CSE 461: Digital System Design**3 credits**

Design using MSI and LSI components. Design of memory subsystem using SRAM and DRAM. Design of various components of a computer: ALU, memory and control unit: hardwired and micro programmed. Microprocessor based designs. Computer bus standards. Design using special purpose controllers, floppy disk controller. Digital control system. Computers in telecommunication and control. The course includes a compulsory 3 hour laboratory work each week. *Prerequisite CSE 260*

CSE 462: Fault Tolerance System**3 credits**

Introduction to Fault Tolerant Systems and Architectures. Fault detection and location in combinational and sequential circuits; Fault test generation for combinational and sequential circuits; Digital simulation as a diagnostic tool. Automatic test pattern generator, memory test pattern and reliability. Performance monitoring self checking circuits, Burst error correction and Triple modular redundancy; Maintenance processors.

CSE 470: Software Engineering**3 credits**

Concepts of software engineering: requirements definition, modular, structure design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools. Software project organization, quality assurance, management and communication skills.

CSE 471: System analysis and design**3 credits**

Introduces students to tools and techniques in systems analysis and design such as data flow diagram and E-R diagrams. Projects by students where they analyse and design a system using these tools. The course includes a compulsory 3 hour laboratory work each week.

CSE 472: Human Computer Interface**3 credits**

An introduction to the concepts for human and computer interface. The importance of computer interface, interface quality and methods of evaluation. The relationship of interface quality to interactions with the computer. Interface design, dimensions of interface variability, dialogue tools and techniques, user centered design and task analysis. User interface implementation, I/O devices and user interface for groupware, multimedia systems and visualization. Student will have to submit four assignments on multimedia work in the lab. *Prerequisite CSE 221*

CSE 473: Decision Support Systems**3 Credits**

This course aims in teaching the integration of business and technical consideration in the design, implementation and management of information systems. Topics include: Is planning and development, business, management, executive, and strategic information systems, including case studies of selected large disaster planning and recovery. The course also includes practical examples of information systems industry.

CSE 474: Simulation and Modeling**3 credits**

Simulation methods, model building, random number generator, statistical analysis of results, validation and verification techniques. Digital simulation of continuous system. Simulation and analytical methods for analysis of computer system and practical problems in business and practice. Introduction to the simulation packages. The course includes a compulsory 3 hour laboratory work alternate week. *Prerequisite MAT 215*

CSE 490: WAN Routing and Technologies (Special Topics)**3 credits**

The course focuses on advanced IP addressing techniques (Variable Length Subnet Masking [VLSM]), intermediate routing protocols (RIP v2, single-area OSPF, EIGRP), command-line interface configuration of switches, Ethernet switching, Virtual LANs (VLANs), Spanning Tree Protocol (STP), and VLAN Trunking Protocol (VTP). The course will also focus on advanced IP addressing techniques (Network Address Translation [NAT], Port Address Translation [PAT], and DHCP), WAN technology and terminology, PPP, ISDN, DDR, Frame Relay, network management, and introduction to optical networking. The course includes a compulsory 3-hour laboratory work each week if the student wishes to obtain CCNA certification. *Prerequisite: CSE 320 and CSE 421*

CSE 490: Special Topics**3 credits**

This course will explore an area of current interest in Computer Science & Engineering. The emphasis will be on thorough study of a contemporary field within CSE, and the course will be made accessible to students with an intermediate, undergraduate CSE background. The syllabus should be approved by the department chair prior to commencement of the term, and a detailed description will be provided before the registration period. *Prerequisite: Permission of instructor*

CSE 491: Independent Study**3 credits**

For students interested in any of the following ways of studying Computer Science & Engineering: independently exploring an advanced topic under a faculty instructor; conducting significant research under a faculty supervisor; or doing an internship in industry under the supervision of industry and faculty advisors. In each case, the student must first identify a faculty member within the CSE department to oversee his/her work, and then write a proposal to the department chair outlining the means and objectives of the project. The proposal must be approved by the intended faculty supervisor and department chair prior to commencement of the term. At the end of the term, the student must submit a detailed report and/or give a presentation of the results, before the final course grade may be awarded. *Prerequisite: Permission of instructor*

Description of Courses from the Department of Electrical and Electronic Engineering**ECE 200: Electrical Circuits I****3 credits**

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including super node and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and Superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits. The course includes a compulsory 3 hour laboratory work per week. *Prerequisites: PHY 112 or appropriate experience in electronic circuits*

ECE 201: Electrical Circuits II**3 credits**

Sinusoidal functions: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. Analysis of single phase ac circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in ac circuits, circuits simultaneously excited by sinusoidal sources of several frequencies, transient response of RL and RC circuits with sinusoidal excitation. Resonance in ac circuits: Series and parallel resonance. Magnetically coupled circuits. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power

calculation. The course includes a compulsory 3 hour laboratory work per week. *Prerequisites: ECE 200*

ECE 202: Electronics Devices and Circuits I

3 credits

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified dc and ac diode models, dynamic resistance and capacitance. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits. Bipolar junction transistor (BJT) as a circuit element: Basic structure. BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch. Single stage BJT amplifier circuits and their configurations: Voltage and current gain, input and output impedances. Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET) as circuit element: structure and physical operation of MOSFETs, body effect, current- voltage characteristics of MOSFETs, biasing discrete and integrated MOS amplifier. The course includes a compulsory 3 hour laboratory work per week. *Prerequisites: ECE 200*

ECE 203: Electronic Devices and Circuits II

3 credits

Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers. Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, dc imperfections. General purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741 Op-Amp. Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation. Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and bandpass filters using Op-Amps. Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages. The course includes a compulsory 3 hour laboratory work per week. *Prerequisites: ECE 202*

ECE 210: Electromagnetic Waves and Fields

3 credits

Electromagnetic waves: solution for free-space conditions, uniform plane wave propagation, wave Solutions for a conducting medium, polarization, surface impedance, numerical problems. Guided waves in two conductor lines: waves between parallel planes, transverse electric and transverse magnetic waves, characteristics of TE and TM waves, transverse electromagnetic waves, velocities of propagation, attenuation in parallel plane guides, wave impedance, electric field and current flow within the conductor, waves in coaxial lines and modes, waves in strip and micro-strip lines, impedances. Rectangular and circular waveguides. Solution of the field equations. *Prerequisites: ECE 201*

ECE 220: Signals and Systems

3 credits

Classification of signals and systems: signals - classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems- classification. Properties of Linear Time Invariant (LTI) systems: linearity, causality, time invariance, memory, stability, invertibility. Time domain analysis of LTI systems: Differential equations - system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response - convolution integral, determination of system properties; state variable - basic concept, state equation and time domain solution. Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion-less systems. Applications of time and frequency domain

analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing. Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application. *Prerequisites: MAT 216, ECE 200*

ECE 230: Semiconductor Devices and Materials

3 credits

Semiconductor fundamentals, crystal structure, Fermi level, energy-band diagram, intrinsic and extrinsic semiconductor, carrier concentration, scattering and drift of electrons and holes, drift current, diffusion mechanism, Hall effect, generation, recombination and injection of carriers, transient response, basic governing equations in semiconductor, physical description of p-n junction, depletion approximation, biasing, transition capacitance, varactor diodes, junction breakdown, space charge effect and diffusion approximation, current-voltage characteristics and temperature dependence, tunneling current, optical absorption in a semiconductor, photovoltaic effect, semiconductor lasers. *Prerequisites: PHY 210, ECE 202*

ECE 310: Introduction to Communication Engineering

3 credits

Basic introduction to Fourier analysis and its application to communication systems. Overview of current communication systems (cellular, radio, and TV broadcasting, satellites, Internet), Fourier series and Fourier transforms, filtering and signal distortion, time domain and frequency domain analysis, analog modulation (AM and FM), digital modulation, noise in communication systems. Overview of current systems: the public-switched telephone network, radio and TV broadcasting, cellular and cordless telephones, satellite communications and paging. The course includes a compulsory 3 hour laboratory work each week. *Prerequisites: CSE 320, ECE 210, ECE 220*

ECE 320: Microwave Engineering

3 credits

Advanced analysis of waveguides, stripline, and microstrip; microwave circuit and device theory including ferrites, junctions and resonators; high frequency generation and amplification, microwave systems. Basic antenna concepts, Radiation Patterns, Beam solid angle, radiation intensity, directivity, effective aperture, antenna field zones, Polarization, impedance, cross field, Poynting vector. Antenna and transmission lines, Radiation from a dipole antenna, antenna temperature. *Prerequisites: ECE 310*

ECE 322: Multimedia Communication

3 credits

Types of media: text, graphic, images, audio, animation and video. Multimedia signal characteristic: sampling, digital representation, signal formats. Signal coding and compression: entropy coding, transform coding, vector quantization. Coding standards: H.26x, LPEG, MPEG. Multimedia communication networks: network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM, internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia. Entertainment networks: cable, satellite and terrestrial TV networks, ADSL and VDSL, high speed modems. Transport protocols: TCP, UDP, IP, Ipv4, Ipv6, FTP, RTP and RTCP, use of MPLS and WDMA. Multimedia synchronization, security, QoS and resource management. Multimedia applications: The WWW, Internet telephony, teleconferencing, HDTV, email and e-commerce. *Prerequisites: CSE 320*

ECE 328: Digital Signal Processing

3 credits

Introduction to Digital Signal Processing : Discrete-time signals and systems, analog to digital conversion, aliasing, impulse response, difference equation, correlation and convolution, transient and steady state response. Discrete transformations: Discrete-Time Fourier Series (DTFS), Discrete-Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT) and their properties, Fast Fourier Transform (FFT). Z transformation - properties, transfer function, and inverse Z transform. Application of Digital Signal Processing. Digital Filters: FIR filters - linear phase filters, filter specifications, designing FIR filter using window, optimal and frequency sampling methods; IIR filters- specifications, designing IIR filters using impulse invariant, bi-linear Z transformation, least-square methods and finite precision effects. MATLAB application to

DSP. This course includes a compulsory 3-hour laboratory work each week. *Prerequisites: MAT 216, ECE 201, ECE220*

ECE 330: Telecommunication Switching Systems

3 credits

Evolution of telecommunication switching and circuits: Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange, Stored programme exchange. Digital exchange - Basic Telecommunication equipment- Telephone handset, Hybrid circuit, Echo suppressors and cancellors, PCM coders, Modems and Relays. Electronic switching: Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Spare switching, Combination switching- Digital switching system hardware configuration, Switching system software, Organization, Switching system call processing software, Hardware software integration. Telecommunication signaling and traffic: Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, Concept of Telecommunication traffic, Grade of service, Modeling switching systems, Blocking models and Delay systems. Integrated digital networks: Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Digital multiplexing techniques, Synchronous, Asynchronous, Plesiocronous multiplexing techniques, SONET / SDH, Integrated Digital Network (IDN) environment- Principles of Integrated Services Digital Network (ISDN)- Cellular Mobile Communication Principles. (*Prerequisites: ECE 201, ECE 310*)

ECE 340: Optoelectronic Devices

3 credits

Elements of Light and Solid State Physics: Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics, Semiconductor Junction Device, Review. Display Devices and Lasers: Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Displays, Liquid Crystal Displays, Numeric Display, Laser Emission, Absorption, Radiation, Population Inversion, Optical feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, Laser applications. Optical detection devices: Photo detector, Thermal detector, Photon Devices, Photo Conductors, Photo diodes, Detector Performance. Optoelectronic modulator and switching devices: Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Optical, Switching and Logic Devices. Optoelectronic integrated circuits: Introduction, hybrid and Monolithic Integration, Applications of Opto Electronics Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices. *Prerequisites: ECE 230*

ECE 350: Control Systems

3 credits

Modeling of continuous systems; computer-aided solutions to systems problems; feedback control systems; stability, frequency response and transient response using root locus, frequency domain and state variable methods. This course includes a compulsory 3-hour laboratory work each week. *Prerequisites: MAT 216, ECE 220*

ECE 360: Measurement and Instrumentation

3 credits

Introduction: Applications, functional elements of a measurement system and classification of instruments. Measurement of electrical quantities: Current and voltage, power and energy measurement. Current and potential transformer. Transducers: mechanical, electrical and optical. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits. Data Transmission and Telemetry: Methods of data transmission, DC/AC telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation. *Prerequisites: ECE 201*

ECE 400: Thesis/Project**4 credits**

A student must undertake a research work on an Electronics and Communication Engineering topic under the guidance of a supervisor. The student is required to prepare and submit the report within the time specified. The report will be graded and a student must get at least a C grade, which is the passing grade for this course.

ECE 401: Internship**non-credit**

This is an optional non-credit course. The internship aims at providing on-the-job exposure to the students and an opportunity for translating theoretical concepts to real life situations. Students are placed in business enterprises, NGOs and research institutions for internship. The duration of internship will be a maximum of 8 weeks. The student is required to prepare and submit the report within the time specified. The report will be graded.

ECE 410: Optical Communication**3 credits**

Introduction: evolution of fiber optic system, Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Signal degradation in optical fibers: Attenuation Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference. The course includes a compulsory 3 hour laboratory work each week. *Prerequisites: ECE 310, ECE 340*

ECE 421: Wireless and Mobile Communications**3 credits**

Introduction to wireless Mobile Communication, history and evolution of mobile radio systems, types of mobile wireless services/systems - cellular, WLL, paging, satellite systems, standards, future trends in personal wireless systems. Cellular concepts and system design fundamentals/frequency management and channel Assignment: Cellular concept and frequency reuse, Multiple Access Schemes, fixed Channel assignment, non-fixed channel assignment and handoff. Interference and system capacity, Trunking and Erlang capacity calculations. Mobile radio propagation :Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and base band impulse response models, Parameters of mobile multipath channels, Antenna systems in mobile radio. Modulations and signal processing: Analog and digital modulation techniques, Performance of various modulation techniques - Spectral efficiency, Error-rate, Power Amplification, Equalization Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding. System examples and design issues: Multiple Access Techniques- FDMA, TDMA and CDMA systems, Operational systems, Wireless networking, security in wireless networks, Design issues in personal wireless systems. The course includes a compulsory 3 hour laboratory work each week. *Prerequisites: ECE 310, ECE 320*

ECE 422: Digital Communications (3 credits)

An introduction to fundamentals of digital communications. Complex random signals. Digital modulations and optimal receiver principles. Baseband and passband transmissions and processing. Interference channels and equalization techniques. Performance analysis including bit error rate calculation and bounds, cutoff rate and channel capacity. Applications in wireless and digital subscriber loops (DSL). Information- definition, unit, entropy. Error control coding-principle, different codes. Spread spectrum analysis. The course includes a compulsory 3 hour laboratory work each week. *Prerequisites: ECE 310*

ECE 423: Analog Integrated Circuit Design**3 credits**

Analysis and design of MOS analog integrated circuits, emphasizing quantitative measures of performance and circuit limitations. Evaluation of circuit performance by means of hand

calculations and computer-aided circuit simulations. Design of operational amplifiers and transconductance stages, broadband amplifiers, biasing circuits, and voltage references. Feedback amplifier design. *Prerequisites: ECE 203*

ECE 424: Power Electronics

3 credits

Power semiconductor devices: Power transistors, Fast recovery diodes, Thyristors, Power TRIAC, MOSFET, IGBT, GTO, UJT and DIAC-characteristics, rating, Protection circuits, Driver Circuits. Power supplies: Single Phase and Three Phase Controlled rectifiers, Design of Trigger circuits, Switching mode regulators- Boost, Buck, Buck-Boost and Cuk regulators, AC voltage regulator. Inverters: Voltage and current source inverters, Resonant, Series inverter, PWM inverter. Choppers: Type A, B, C and D choppers, Pulse width modulation - Gating requirements. Motor control: DC motor drives, Induction and Synchronous motor drives, Stepper motor control, Switched reluctance and brushless motor drives. The course includes a compulsory 3 hour laboratory work each week. *Prerequisites: ECE 203*

ECE 425: Theory and Fabrication of Integrated Circuit Devices

3 credits

Laboratory and lecture course on the physical theory, design, and fabrication of devices suitable for integrated circuitry; includes the electronic properties of semiconductors and techniques (epitaxial growth, oxidation, photolithography diffusion, ion implantation, metallization, characterization) for fabricating integrated circuit devices such as p-n junction diodes, bipolar transistors and field effect transistors. The course includes a 3-hour laboratory each week.

ECE 430: Satellite Communications

3 credits

Orbital parameters: Orbital parameters, Orbital perturbations, Geo stationary orbits. Low Earth and medium Earth orbits. Frequency selection, Frequency co-ordination and regulatory services, Sun transit outages, Limits of visibility, Attitude and Orientation control, Spin stabilization techniques, Gimbal platform. Link calculations: Space craft configuration, Payload and supporting subsystems, Satellite up link-down link, Link power budget, C/No, G/T, Noise temperature, System noise, Propagation factors, Rain and Ice effects, Polarization calculations. Access techniques: Modulation and Multiplexing: Voice, Data, Video, Analog and Digital transmission systems, Multiple access techniques: FDMA, TDMA, T1- T2 carrier systems, SPADE, SS-TDMA, CDMA, Assignment Methods, Spread spectrum communication, Compression techniques. Earth station parameters: Earth station location, Propagation effects of ground, High power transmitters. Receivers: Low noise front-end amplifiers, MIC devices, Antennas: Reflector antennas, Cassegranian feeds, Measurements on G/T and Eb/No. Satellite applications, Mobile Satellite services. *Prerequisites: CSE 320, ECE310, ECE 422*

ECE 440: High Performance Communication Networks

3 credits

Basics of networks: Telephone, computer, cable television and wireless networks, networking principles, and digitization: service integration, network services and layered architecture, traffic characterization and QOS, network services: network elements and network mechanisms. Packet switched networks: OSI and IP models: Ethernet (IEEE 802.3); token ring (IEEE 802.5), FDDI, DQDB, frame relay: SMDS: Internet working with SMDS. Internet and TCP/IP networks: Overview; Internet protocol; TCP and VDP, performance of TCP / IP networks circuit -switched networks: SONET; DWDM, Fiber to home, DSL. Intelligent networks, CATV.ATM and wireless networks: Main features - addressing, signaling and routing; ATM header structure - adaptation layer, management and control; BISDN; Interworking with ATM, Wireless channel, link level design, channel access; Network design and wireless networks. Optical networks and switching: Optical links - WDM systems, cross-connects, optical LANs, optical paths and networks; TDS and SDS: modular switch designs- packet switching, distributed, shared, input and output buffers. *Prerequisites: CSE 421*

ECE 470: Biomedical Instrumentation

3 credits

Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics. Measurement of bio-signals: Ethical issues, transducers, amplifiers and filters.

Electrocardiogram: electrocardiography, phono cardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator. Blood pressure: systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring. Blood flow measurement: Plethymography and electromagnetic flow meter. Measurement and interpretation: electroencephalogram, cerebral angiograph and cronical X-ray. Brain scans. Electromyogram (EMG). Tomograph: Positron emission tomography and computer tomography. Magnetic resonance imaging. Ultra-sonogram, Patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body. *Prerequisites: ECE 203, CSE 350*

ECE 471: Protocol Engineering

3 credits

Protocols and languages. Protocol structure. Structured protocol design. Fundamentals of protocol engineering. Specification and modeling. State machines and reach-ability analysis. Formulation of desirable properties of protocols. Formal logic and deduction. Verification techniques. Formal description language (e.g., using PROMELA). Validation and conformance testing. Computer aided design tools for protocol engineering (simulation and verification tools); for example, Spin. A major project involving comprehensive design and verification of a non-trivial protocol (like Signaling system 7 for telecommunication, HTTP, SNMP, TCP, etc). *Prerequisites: CSE 320*

ECE 481: Telecommunication Policy and Management

3 credits

Radio frequency management, allocation of spectrum, regulations for spectrum use, common carriers, Satellite and cables, competition and compliance, ITU, long term policy planning. Management and organization of electronics and telecommunications industry.

ECE 490: Special Topics

3 credits

This course will explore an area of current interest in Electronics and Communication Engineering. The emphasis will be on thorough study of a contemporary field within ECE, and the course will be made accessible to students with an intermediate, undergraduate ECE background. The syllabus should be approved by the department chair prior to commencement of the term, and a detailed description will be provided before the registration period. *Prerequisites: Permission of instructor*

ECE 491: Independent Study

3 credits

For students interested in any of the following ways of studying Electronics and Communication Engineering: independently exploring an advanced topic under a faculty instructor; conducting significant research under a faculty supervisor; or doing an internship in industry under the supervision of industry and faculty advisors. In each case, the student must first identify a faculty member within the CSE department to oversee his/her work, and then write a proposal to the department chair outlining the means and objectives of the project. The proposal must be approved by the intended faculty supervisor and department chair prior to commencement of the term. At the end of the term, the student must submit a detailed report and/or give a presentation of the results, before the final course grade may be awarded. (Prerequisites: Permission of instructor)

EEE 201: Electrical Circuits I

3 credits

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including supernode and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and Superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses. Magnetic quantities and variables: Flux, permeability and reluctance, magnetic

field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits. (Prerequisites: PHY 111 or appropriate experience in electronic circuits)

EEE 202: Electrical Circuits I Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 201 and will design simple systems. The students will learn the basics of electrical CAD tools in designing these simple systems.

EEE 203: Electrical Circuits II **3 credits**

Sinusoidal functions: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. Analysis of single phase ac circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in ac circuits, circuits simultaneously excited by sinusoidal sources of several frequencies, transient response of RL and RC circuits with sinusoidal excitation. Resonance in ac circuits: Series and parallel resonance. Magnetically coupled circuits. Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation. *Prerequisite: EEE 201, EEE 202*

EEE 204: Electrical Circuits II Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 203 and will design simple systems. The students will make use of electrical CAD tools in designing these systems.

EEE 205: Electronics Devices and Circuits I **3 credits**

Basic Semiconductor and pn-junction theory: Energy Bands, Conductors, Insulators and semiconductors, p-type and n-type semiconductors, Drift and Diffusion Current. P-N junction as a circuit element: operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified dc and ac diode models, dynamic resistance and capacitance. Diode applications: Half wave and full wave rectifiers, rectifiers with filter capacitor, clamping and clipping circuits. Zener diode: characteristics of a zener diode, zener shunt regulator. Bipolar junction Transistors (BJT): Basic structure, BJT characteristics and regions of operation, BJT Currents, BJT Terminal Voltages, BJT voltage amplification. Bipolar Junction Transistor Biasing: The dc load line and bias point, biasing the BJT for discrete circuits, small signal equivalent circuit models, h parameters. Single-stage BJT amplifier circuits and their configurations: Voltage and current gain, input and output impedances. Field-Effect Transistors (FET): Construction and Characteristics of JFET, transfer characteristics, FET voltage amplification, FET bias circuits. Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET) as circuit element: structure and physical operation of MOSFETs, body effect, current-voltage characteristics of MOSFETs, biasing discrete and integrated MOS amplifier. *Prerequisites: EEE 201, EEE 202*

EEE 206: Electronics Devices and Circuits I Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 205 and will design simple systems. The students will learn the basics of electronic CAD tools in designing these simple systems.

EEE 207: Electronic Devices and Circuits II **3 credits**

General frequency considerations for single stage or multi stage network: low and high frequency analysis and bode plot, multistage frequency effect and determining the cut-off frequencies. Operational Amplifiers (Op-Amp): Opamp characteristics, open loop voltage gain, differential input voltage, CMRR, zero crossing and voltage level detector and their applications; inverting amplifier, inverting adder, voltage follower, non-inverting amplifier, differentiator, integrator, and subtractor. DC performance: bias, offset and drift. AC performance: frequency parameter, unity-gain bandwidth, and slew rate. Various applications of opamps. Active filter: frequency response

of four general classifications of filters for ideal and practical conditions; design and analysis of low pass filter that has -20dB/decade, -40dB/decade and -60dB/decade roll off; design and analysis of high pass filter that has 20dB/decade, 40dB/decade and 60dB/decade roll off. Band pass filter: narrow-band and wide-band filter. Feedback Amplifier: classification of amplifier as voltage, current, trans-resistance and trans-conductance amplifier, concept of feedback, advantage of negative feedback, general characteristics of negative feedback; input, output resistance and transfer gain of four basic amplifiers with and without feedback, effect of feedback on amplifier bandwidth, condition of stability and the Nyquist criterion. Sinusoidal oscillator: the Barkhausen criterion, phase shift oscillator, general form of oscillator circuits; Colpitts oscillator, Hartley Oscillator, Crystal oscillator. Power amplifiers: Class A, Class b and Class AB amplifiers; analysis of AC and DC load lines. *Prerequisites: EEE 205, EEE 206*

EEE 208: Electronic Devices and Circuits II Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 207 and will design simple systems. The students will make use of electronic CAD tools in designing these systems.

EEE 209: Semiconductor Devices and Materials **3 credits**

Semiconductors in equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level. Carrier transport processes and excess carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level. PN junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance. Bipolar Junction Transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll equations and circuit synthesis. Metal-semiconductor junction: Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts. MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET. Junction Field-Effect-Transistor: Introduction, qualitative theory of operation, pinch-off voltage and current-voltage relationship. *Prerequisites: EEE 205, EEE 206*

EEE 221: Energy Conversion I **3 credits**

Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase induction motor: Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control. Single phase induction motor: Theory of operation, equivalent circuit and starting. *Prerequisites: EEE 203, EEE 204*

EEE 223: Energy Conversion II **3 credits**

Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting. DC generator: Types, no-load voltage characteristics, build-up of a self excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation. DC motor: Torque, counter emf, speed,

torque-speed characteristics, starting and speed regulation. Introduction to wind turbine generators Construction and basic characteristics of solar cells. *Prerequisites: EEE 221*

EEE 224: Energy Conversion Laboratory

1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 221 and EEE 223 and will design simple systems.

EEE 241: Electromagnetic Waves and Fields

3 credits

Electromagnetic waves: Electric field and related theories, Electric potential, Solution of the field equations, Solution for free-space conditions, Solutions of Laplace's equation, Capacitance, Numerical problems, Magnetic field and related theories, Internal and external impedances, Stored energy of electric and magnetic field, Application of electric flux: basic idea about transformer, Maxwell's equation and its application, Solution of Maxwell's equation, velocities of propagation, Surface impedance and depth of penetration, Characteristic impedance, Polarization, Uniform plane wave propagation and reflection, Characteristics of plane wave, Power loss in imperfect dielectric material, Attenuation constant and phase constant, Good conductor and low loss dielectric materials, Polarization angle. *Prerequisites: EEE 203, EEE 204*

EEE 243: Signals and Systems

3 credits

Classification of signals and systems: signals - classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems - classification. Properties of Linear Time Invariant (LTI) systems: linearity, causality, time invariance, memory, stability, invertibility. Time domain analysis of LTI systems: Differential equations - system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response - convolution integral, determination of system properties; state variable - basic concept, state equation and time domain solution. Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion-less systems. Applications of time and frequency domain analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing. Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application. *Prerequisites: MAT 216, EEE 201, EEE 202*

EEE 301: Digital Electronics

3 credits

Different types of number systems, their representation, conversion and mathematical operation. Codes: BCD, alphanumeric, gray and excess-3. Digital logic: Boolean algebra, De Morgan's laws. Logic minimization. Logic gates and their truth tables. Basic logic gates in CMOS: DC characteristics, noise margin and power dissipation. Modular combinational circuit design: pass gates, multiplexer, de-multiplexer, encoder, decoder and comparators. Arithmetic logic circuit design: Half adder, full adder, half subtractor, full subtractor. Sequential circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: shift registers, counters and their applications. Synthesis of digital circuits using Hardware Description Language (HDL). *Prerequisites: EEE207, EEE 208, EEE209*

EEE 302: Digital Electronics Laboratory

1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 301 and will design simple systems.

EEE 303: Measurement and Instrumentation

3 credits

Introduction: Applications, functional elements of a measurement system and classification of instruments. Measurement of electrical quantities: Current and voltage, power and energy measurement. Current and potential transformer. Transducers: mechanical, electrical and optical.

Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque. Basic elements of dc and ac signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits. Data Transmission and Telemetry: Methods of data transmission, DC/AC telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.
Prerequisites: EEE 203, EEE 204

EEE 304: Measurement and Instrumentation Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 303 and will design simple systems.

EEE 305: Control Systems **3 credits**

Modeling of continuous systems; computer-aided solutions to systems problems; feedback control systems; stability, frequency response and transient response using root locus, frequency domain and state variable methods. *Prerequisites: MAT 216, EEE 243*

EEE 306: Control Systems Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 305 and will design simple systems.

EEE 307: Optoelectronic Devices **3 credits**

Elements of Light and Solid State Physics: Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics, Semiconductor Junction Device, Review. Display Devices and Lasers: Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Displays, Liquid Crystal Displays, Numeric Display, Laser Emission, Absorption, Radiation, Population Inversion, Optical feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, Laser applications. Optical detection devices: Photo detector, Thermal detector, Photon Devices, Photo Conductors, Photo diodes, Detector Performance. Optoelectronic modulator and switching devices: Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Optical, Switching and Logic Devices. Optoelectronic integrated circuits: Introduction, hybrid and Monolithic Integration, Applications of Opto Electronics Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices. *Prerequisites: EEE 209*

EEE 321: Power System I **3 credits**

Network representation: Single line and reactance diagram of power system and per unit. Line representation: equivalent circuit of short, medium and long lines. Load flow: Gauss- Siedel and Newton Raphson Methods. Power flow control: Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor. Fault analysis: Short circuit current and reactance of a synchronous machine. Symmetrical fault calculation methods: symmetrical components, sequence networks and unsymmetrical fault calculation. Protection: Introduction to relays, differential protection and distance protection. Introduction to circuit breakers. Typical layout of a substation. Load curves: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor and plant factor. *Prerequisites: EEE 223, EEE 224*

EEE 323: Power System II **3 credits**

Transmission lines cables: overhead and underground. Stability: swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation. Factors affecting stability. Reactive power compensation. Flexible AC transmission system (FACTS). High voltage DC transmission system. Power quality: harmonics, sag and swell.
Prerequisites: EEE 321, EEE 322

EEE 341: Introduction to Communication Engineering**3 credits**

Communication systems Basic principle, fundamental elements, basic modes of communication, transmission media types. Brief discussion on Fourier Series and Fourier Transform. Application of Fourier analysis in Communication engineering, such as in multiplexing, modulation, sampling. Noise: Source, characteristics of various types of noise and signal to noise ratio, conditions for distortionless transmission. Analog modulation: amplitude modulation—introduction, double sideband, single sideband, vestigial side band, quadrature amplitude modulation(QAM):spectral analysis of each type, envelope and synchronous detection: angle modulation—instantaneous frequency, frequency modulation(FM) and phase modulation(PM),demodulation of FM and PM. Sampling---sampling theorem, Nyquist criterion, PAM, PCM, Differential PCM, demodulation of PCM. Digital Modulation: Amplitude Shift Keying-principle, ON-OFF keying, bandwidth requirements, detection; Frequency Shift Keying(FSK)-principle, bandwidth requirements, detection; Phase Shift Keying(PSK)-principle, bandwidth requirements, detection; quadrature PSK. Multiplexing—TDM, FDM. Overview of current systems---PSTN, Cellular telephones, Satellite Communication. *Prerequisites: EEE 241, EEE 243*

EEE 342: Introduction to Communication Engineering Laboratory**1.5 credits
3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 341 and will design simple systems.

EEE 343: Digital Signal Processing**3 credits**

Introduction to Digital Signal Processing : Discrete-time signals and systems, analog to digital conversion, aliasing, impulse response, difference equation, correlation and convolution, transient and steady state response. Discrete transformations: discrete-time Fourier series (DTFS), discrete-time Fourier transform (DTFT), discrete Fourier transform (DFT) and their properties, fast Fourier transform (FFT). Z transformation - properties, transfer function, and inverse Z transform. Application of Digital Signal Processing. Digital Filters: FIR filters - linear phase filters, filter specifications, designing FIR filter using window, optimal and frequency sampling methods; IIR filters – specifications, designing IIR filters using impulse invariant, bi-linear Z transformation, least-square methods and finite precision effects. MATLAB application to DSP. *Prerequisites: MAT 216, EEE 203, EEE 204, EEE243*

EEE 344: Digital Signal Processing Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 343 and will design simple systems.

EEE 347: Telecommunication Switching Systems**3 credits**

Evolution of telecommunication switching and circuits: Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange, Stored programme exchange. Digital exchange – Basic Telecommunication equipment – Telephone handset, Hybrid circuit, Echo suppressors and cancellors, PCM coders, Modems and Relays. Electronic switching: Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Spare switching, Combination switching – Digital switching system hardware configuration, Switching system software, Organization, Switching system call processing software, Hardware software integration. Telecommunication signaling and traffic: Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, Concept of Telecommunication traffic, Grade of service, Modeling switching systems, Blocking models and Delay systems. Integrated digital networks: Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Digital multiplexing techniques, Synchronous, Asynchronous, Plesiocronous multiplexing techniques, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN) – Cellular Mobile Communication Principles. *Prerequisites: EEE 203, EEE 204, EEE 341, EEE 342*

EEE 349: Microwave Engineering**3 credits**

Frequency spectrum, VHF, UHF and microwave frequency ranges, microwave, advantages and applications, Overview of Maxwell's and Helmholtz Equations, Plane wave and its solution, Poynting's theorem, Plane wave reflection for normal and oblique incidence. Transmission Line: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith Chart: impedance matching and lossy transmission lines. Waveguides: General formulation, modes of propagation and losses in parallel plate, rectangular and circular waveguides. Strip-line, Micro strips, Resonators: structures and characteristics. Rectangular Resonant Cavities: Energy storage, losses, Q. Microwave circuit and devices: microwave tubes, transmit time and velocity modulation, Klystron, Multi-cavity Klystron, Oscillator, Magnetron. Radiation: Small current element, radiation resistance, Radiation pattern and properties, Hertzian and halfwave Dipoles, Beam solid angle, radiation intensity, directivity, effective aperture. Antenna: Introduction to antenna arrays and their design, radiation from a dipole antenna, antenna temperature, Mono-pole, horn, rhombic and parabolic reflectors. Microwave Communication systems: Types, Friis power transmission formula, Microwave transmitters and receivers. RADAR systems: Application, Radar equation, range, Types of Radar, Polarization, noise, interference, Atmospheric and ground effects. Other applications of microwave, microwave oven etc. *Prerequisites: EEE 341, EEE 342*

EEE 350: Microwave Engineering Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 349 and will design simple systems.

EEE 361: Data Communications**3 credits**

Data communication course emphasizes on design issues and technologies of the two lower layers (physical layer and data link layer) of the communication stack. There will be an introduction to the "layered" approach to networks and to the OSI and TCP/IP layers in detail to understand their functions and services. Basic concepts such as data transmission terminology, encoding techniques, modulation, multiplexing, error detection and control, and different transmission media are included. LAN technology will also be covered.

EEE 362: Data Communications Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 361 and will design simple systems.

EEE 363: Multimedia Communication**3 credits**

Types of media: text, graphic, images, audio, animation and video. Multimedia signal characteristic: sampling, digital representation, signal formats. Signal coding and compression: entropy coding, transform coding, vector quantization. Coding standards: H.26x, LPEG, MPEG. Multimedia communication networks: network topologies and layers, LAN, MAN, WAN, PSTN, ISDN, ATM, internetworking devices, the internet and access technologies, enterprise networks, wireless LANs and wireless multimedia. Entertainment networks: cable, satellite and terrestrial TV networks, ADSL and VDSL, high speed modems. Transport protocols: TCP, UDP, IP, Ipv4, Ipv6, FTP, RTP and RTCP, use of MPLS and WDMA. Multimedia synchronization, security, QoS and resource management. Multimedia applications: The WWW, Internet telephony, teleconferencing, HDTV, email and e-commerce. *Prerequisites: EEE 361*

EEE 365: Microprocessors**3 credits**

Introduction to different types of microprocessors. Microprocessor architecture, instruction set, interfacing/O operation, interrupt structure, DMA. Microprocessor interface ICs. Advanced microprocessor concept of microprocessor based system design. *Prerequisites: EEE 301, EEE 302*

EEE 366: Microprocessors Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 365 and will design simple systems.

EEE 400: Thesis/Project**6 credits**

The duration of thesis/project work will be three semesters. A student must undertake a research work on an Electrical and Electronic Engineering topic under the guidance of a supervisor. The student is required to prepare and submit the report within the time specified. The report will be graded and a student must get at least a C grade, which is the passing grade for this course.

EEE 401: Internship**non-credit**

This is an optional non-credit course. The internship aims at providing on-the-job exposure to the students and an opportunity for translating theoretical concepts to real life situations. Students are placed in business enterprises, NGOs and research institutions for internship. The duration of internship will be a maximum of 8 weeks. The student is required to prepare and submit the report within the time specified. The report will be graded.

EEE 411: VLSI Design**3 credits**

VLSI technology: Top down design approach, technology trends and design styles. Review of MOS transistor theory: Threshold voltage, body effect, I-V equations and characteristics, latch-up problems, NMOS and CMOS inverter, pass-transistor and transmission gates. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. CMOS subsystem design: Adders, multiplier and memory system, arithmetic logic unit. Basic design methodologies: full custom and semi-custom design. Programmable logic arrays (PLAs), Field programmable gate arrays (FPGA), I/O systems. VLSI testing: objectives and strategies. Introduction to VHDL Hardware description Language.

Prerequisites: EEE 205, EEE 206

EEE 412: VLSI Design Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 411 and will design simple systems.

EEE 413: Digital System Design**3 credits**

Design using MSI and LSI components. Design of memory subsystem using SRAM and DRAM. Design of various components of a computer: ALU, memory and control unit: hardwired and micro programmed. Microprocessor based designs. Computer bus standards. Design using special purpose controllers, floppy disk controller. Digital control system. Computers in telecommunication and control. *Prerequisites: EEE 301, EEE 302*

EEE 414: Digital System Design Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 413 and will design simple systems.

EEE 415: Analog Integrated Circuit Design**3 credits**

Analysis and design of MOS analog integrated circuits, emphasizing quantitative measures of performance and circuit limitations. Evaluation of circuit performance by means of hand calculations and computer-aided circuit simulations. Design of operational amplifiers and transconductance stages, broadband amplifiers, biasing circuits, and voltage references. Feedback amplifier design. *Prerequisites: EEE 207, EEE 208*

EEE 421: Power Electronics**3 credits**

Power semiconductor devices: Power transistors, Fast recovery diodes, Thyristors, Power TRIAC, MOSFET, IGBT, GTO, UJT and DIAC-characteristics, rating, Protection circuits, Driver Circuits. Power supplies: Single Phase and Three Phase Controlled rectifiers, Design of Trigger circuits, Switching mode regulators – Boost, Buck, Buck-Boost and Cuk regulators, AC voltage regulator. Inverters: Voltage and current source inverters, Resonant, Series inverter, PWM inverter. Choppers: Type A, B, C and D choppers, Pulse width modulation - Gating requirements. Motor control: DC motor drives, Induction and Synchronous motor drives, Stepper motor control, Switched reluctance and brushless motor drives. *Prerequisites: EEE 207, EEE 208*

EEE 422: Power Electronics Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 421 and will design simple systems.

EEE 423: Power Plant Engineering**3 credits**

Power plants: general layout and principles, steam turbine, gas turbine, combined cycle gas turbine, hydro and nuclear. Power plant instrumentation. Selection of location: Technical, economical and environmental factors. Load forecasting. Generation scheduling: deterministic and probabilistic. Electricity tariff: formulation and types. *Prerequisites: EEE 321, EEE 322*

EEE 425: Switchgear and Protection**3 credits**

Purpose of power system protection. Criteria for detecting faults: over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Instrument transformers: CT and PT. Electromechanical, electronic and digital Relays: basic modules, over current, differential, distance and directional. Trip circuits. Unit protection schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Miniature circuit breakers and fuses. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF6 and vacuum. *Prerequisites: EEE 321, EEE 322*

EEE 426: Switchgear and Protection Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 425 and will design simple systems.

EEE 427: Power System Reliability**3 credits**

Review of probability concepts. Probability distribution: Binomial, Poisson, and Normal. Reliability concepts: Failure rate, outage, mean time to failure, series and parallel systems and redundancy. Markov process. Probabilistic generation and load models. Reliability indices: Loss of load probability and loss of energy probability. Frequency and duration. Reliability evaluation techniques of single area system. *Prerequisites: EEE 321, EEE 322*

EEE 429: Power System Operation and Control**3 credits**

Principles of power system operation: SCADA, conventional and competitive environment. Unit commitment, static security analysis, state estimation, optimal power flow, automatic generation control and dynamic security analysis. *Prerequisites: EEE 321, EEE 322*

EEE 431: High Voltage Engineering**3 credits**

High voltage DC: Rectifier circuits, voltage multipliers, Van-de-Graaf and electrostatic generators. High voltage AC: Cascaded transformers and Tesla coils. Impulse voltage: Shapes, mathematical analysis, codes and standards, single and multi-stage impulse generators, tripping and control of impulse generators. Breakdown in gas, liquid and solid dielectric materials. Corona. High voltage measurements and testing. Over-voltage phenomenon and insulation coordination. Lightning and switching surges, basic insulation level, surge diverters and arresters. *Prerequisites: EEE 323*

EEE 432: High Voltage Engineering Laboratory**1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 431 and will design simple systems.

EEE 441: Wireless and Mobile Communications**3 credits**

Introduction to wireless Mobile Communication, history and evolution of mobile radio systems, types of mobile wireless services/systems - cellular, WLL, paging, satellite systems, standards, future trends in personal wireless systems. Cellular concepts and system design fundamentals/frequency management and channel Assignment: Cellular concept and frequency reuse, Multiple Access Schemes, fixed Channel assignment, non-fixed channel assignment and handoff. Interference and system capacity, Trunking and Erlang capacity calculations. Mobile radio

propagation :Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and base band impulse response models, Parameters of mobile multipath channels, Antenna systems in mobile radio. Modulations and signal processing: Analog and digital modulation techniques, Performance of various modulation techniques - Spectral efficiency, Error-rate, Power Amplification, Equalization Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding. System examples and design issues: Multiple Access Techniques – FDMA, TDMA and CDMA systems, Operational systems, Wireless networking, security in wireless networks, Design issues in personal wireless systems. *Prerequisites: EEE 341, EEE 342, EEE 349, EEE 350*

EEE 442: Wireless and Mobile Communications Laboratory 1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 441 and will design simple systems.

EEE 443: Optical Communications 3 credits

Introduction: evolution of fiber optic system, Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Signal degradation in optical fibers: Attenuation– Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference. *Prerequisites: EEE 341, EEE 342, EEE 307*

EEE 444: Optical Communications Laboratory 1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 443 and will design simple systems.

EEE 445: Digital Communications 3 credits

An introduction to fundamentals of digital communications. Complex random signals. Digital modulations and optimal receiver principles. Baseband and passband transmissions and processing. Interference channels and equalization techniques. Performance analysis including bit error rate calculation and bounds, cutoff rate and channel capacity. Applications in wireless and digital subscriber loops (DSL). Information- definition, unit, entropy. Error control coding-principle, different codes. Spread spectrum analysis. *Prerequisites: EEE 341, EEE 342*

EEE 446: Digital Communications Laboratory 1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 445 and will design simple systems.

EEE 447: Satellite Communications 3 credits

Orbital parameters: Orbital parameters, Orbital perturbations, Geo stationary orbits. Low Earth and medium Earth orbits. Frequency selection, Frequency co-ordination and regulatory services, Sun transit outages, Limits of visibility, Attitude and Orientation control, Spin stabilization techniques, Gimbal platform. Link calculations: Space craft configuration, Payload and supporting subsystems, Satellite up link-down link, Link power budget, C/No, G/T, Noise temperature, System noise, Propagation factors, Rain and Ice effects, Polarization calculations. Access techniques: Modulation and Multiplexing: Voice, Data, Video, Analog and Digital transmission systems, Multiple access techniques: FDMA, TDMA, T1- T2 carrier systems, SPADE, SS-TDMA, CDMA, Assignment Methods, Spread spectrum communication, Compression techniques. Earth station parameters: Earth station location, Propagation effects of ground, High power transmitters. Receivers: Low noise front-end amplifiers, MIC devices, Antennas: Reflector antennas, Cassegranian feeds, Measurements on G/T and E_b/N_o . Satellite applications, Mobile

Satellite services. *Prerequisites: EEE 361, EEE 341, EEE 342, EEE 445, EEE 446*

EEE 449: High Performance Communication Networks

3 credits

Basics of networks: Telephone, computer, cable television and wireless networks, networking principles, and digitization: service integration, network services and layered architecture, traffic characterization and QOS, network services: network elements and network mechanisms. Packet switched networks: OSI and IP models: Ethernet (IEEE 802.3); token ring (IEEE 802.5), FDDI, DQDB, frame relay: SMDS: Internet working with SMDS. Internet and TCP/IP networks: Overview; Internet protocol; TCP and VDP, performance of TCP / IP networks circuit -switched networks: SONET; DWDM, Fiber to home, DSL. Intelligent networks, CATV.ATM and wireless networks: Main features - addressing, signaling and routing; ATM header structure - adaptation layer, management and control; BISDN; Interworking with ATM, Wireless channel, link level design, channel access; Network design and wireless networks. Optical networks and switching: Optical links - WDM systems, cross-connects, optical LANs, optical paths and networks; TDS and SDS: modular switch designs – packet switching, distributed, shared, input and output buffers. *Prerequisites: EEE 465*

EEE 451: Telecommunication Policy and Management

3 credits

Radio frequency management, allocation of spectrum, regulations for spectrum use, common carriers, Satellite and cables, competition and compliance, ITU, long term policy planning. Management and organization of electronics and telecommunications industry.

EEE 453: LAN Switching and WAN Technologies

3 credits

This course provides a comprehensive, theoretical, and practical approach to learning the technologies and protocols needed to design and implement a converged switched network. And also discusses the WAN technologies and network services required by converged applications in enterprise networks. The course explains design issues, how to configure a switch for basic functionality and how to implement Virtual LAN's, VTP, and Inter-VLAN routing in a converged network. Later part of the course uses the Cisco Network Architecture to introduce integrated network services and explains how to select the appropriate devices and technologies to meet network requirements. Students learn how to implement and configure common data link protocols and how to apply WAN security concepts, principles of traffic, access control, and addressing services, and covers trouble shooting issues. *Prerequisites: EEE 361 and EEE 465*

EEE 454: LAN Switching and WAN Technologies Laboratory **1.5 credits, 3 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 453 and will design simple systems.

EEE 455: Fundamentals of Wireless LANs

3 credits

This course focuses on the design, planning, implementation, operation, and troubleshooting of wireless networks. It covers a comprehensive overview of technologies, security, and design best practices. Acquired competencies include design a logical wireless LAN architecture for mobile wireless users in compliance with IEEE 802.11 standards. Demonstrate knowledge of the theory regarding the most common factors that influence WLANs (including EM spectrum, radio wave propagation, modulation techniques, and frequency and channel usage in wireless technologies). This course will also provide installation guideline of in-building and building-to-building WLANs that meet mobility and throughput specifications, including the site survey and documentation. Performing hardware setup and software configuration of wireless products including security using WEP, Cisco LEAP, and 802.1x protocols and vendor interoperability strategies will also be covered. *Prerequisites: EEE 341, EEE 342*

EEE 456: Fundamentals of Wireless LANs Laboratory

1.5 credits, 3 hours/week

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 455 and will design simple systems.

EEE 461: Biomedical Instrumentation**3 credits**

Human body: Cells and physiological systems. Bioelectricity: genesis and characteristics. Measurement of bio-signals: Ethical issues, transducers, amplifiers and filters. Electrocardiogram: electrocardiography, phono cardiograph, vector cardiograph, analysis and interpretation of cardiac signals, cardiac pacemakers and defibrillator. Blood pressure: systolic, diastolic mean pressure, electronic manometer, detector circuits and practical problems in pressure monitoring. Blood flow measurement: Plethymography and electromagnetic flow meter. Measurement and interpretation: electroencephalogram, cerebral angiograph and cronical X-ray. Brain scans. Electromyogram (EMG). Tomograph: Positron emission tomography and computer tomography. Magnetic resonance imaging. Ultrasonogram. Patient monitoring system and medical telemetry. Effect of electromagnetic fields on human body. *Prerequisites: EEE 207, EEE 208, EEE 301, EEE 302*

EEE 463: Protocol Engineering**3 credits**

Protocols and languages. Protocol structure. Structured protocol design. Fundamentals of protocol engineering. Specification and modeling. State machines and reach-ability analysis. Formulation of desirable properties of protocols. Formal logic and deduction. Verification techniques. Formal description language (e.g., using PROMELA). Validation and conformance testing. Computer aided design tools for protocol engineering (simulation and verification tools); for example, Spin. A major project involving comprehensive design and verification of a non-trivial protocol (like Signaling system 7 for telecommunication, HTTP, SNMP, TCP, etc). *Prerequisites: EEE 361*

EEE 465: Computer Networks**3 credits**

An introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Topics to be covered include: overview of network architectures, applications, network programming interfaces (e.g., sockets), transport, congestion, routing, and data link protocols, addressing, local area networks, wireless networks, and network security. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite. *Prerequisites: EEE 361*

EEE 466: Computer Networks Laboratory**1 credit, 2 hours/week**

In this course, students will perform experiments to verify practically the theories and concepts learned in EEE 465 and will design simple systems.

EEE 490: Special Topics**3 credits**

This course will explore an area of current interest in Electrical and Electronic Engineering. The emphasis will be on thorough study of a contemporary field within EEE, and the course will be made accessible to students with an intermediate, undergraduate EEE background. The syllabus should be approved by the department chair prior to commencement of the term, and a detailed description will be provided before the registration period. *Prerequisites: Permission of instructor*

EEE 491: Independent Study**3 credits**

For students interested in any of the following ways of studying Electrical and Electronic Engineering: independently exploring an advanced topic under a faculty instructor; conducting significant research under a faculty supervisor; or doing an internship in industry under the supervision of industry and faculty advisors. In each case, the student must first identify a faculty member within the department to oversee his/her work, and then write a proposal to the department chair outlining the means and objectives of the project. The proposal must be approved by the intended faculty supervisor and department chair prior to commencement of the term. At the end of the term, the student must submit a detailed report and/or give a presentation of the results, before the final course grade may be awarded. *Prerequisites: Permission of instructor*

School of Law

Course Description

Major Law Courses:

LAW 101: The Jurisprudence of Legal Concepts and the Legal System of Bangladesh

The course will discuss the conceptual framework of contemporary systems of private and public law, including general theories of rights, duties and powers. In this context certain main institutions of law will be considered such as property, ownership and possession; contract and promising; legal personality, delict, negligence and risk; responsibility and punishment, evidence and procedure; rights and right creation. In each case there will be consideration of the extent to which particular legal or social values are presupposed by or flow from particular institutions. To understand legal system of Bangladesh and hierarchy of courts, their constitution and function with power and jurisdiction, Code of Conduct and Ethics as prescribed by the Bangladesh Bar Council.

LAW 102: Obligations: Contract Law

The law of voluntary obligations, contract and unilateral promise, Formation of contract essential elements; vitiating elements of Contract - Coercion, Fraud, Misrepresentation, Undue influence and Mistake; contractual Capacity; Form of Consideration - rules to test the validity of consideration; Types of contract in terms of validity and operation; agreements expressly declared void under the law; nature of Quasi Contracts/law of unjust enrichment; dissolution of contracts; remedies for breach of contract.

LAW 103: Delict : Law of Tort

Nature and scope of the Law of Tort, general conditions of liability, general defenses, general remedies, parties to an action in tort, remoteness of damage. Specific torts: Trespass to the person, goods and land; malicious prosecution, defamation, negligence, nuisance, vicarious liability, strict liability, liabilities for dangerous land and structures. Remedies in torts; specific restitution - Injunction and damages.

LAW 104: Constitutional Law

Introduction-Conception and elements of State-Definition, scope and nature of Constitutional Law - contents and classification of Constitutions. General theories of Constitution - classification of Constitutions, Supremacy of the Constitutions. Conventions of the Constitution - Ministerial responsibility - Sovereignty of Parliament - Theory of separation of powers - Rule of Law compared with Administrative judiciary. Fundamental Rights and Principles - Fundamental Principles of State Policy and their purpose. The Executive. The Legislature. Unconstitutional legislation - Ministerial responsibility - Parliamentary sovereignty. The Organization of judiciary, Jurisdiction and powers of the Supreme Court and its Divisions Superintendence and control over lower courts, separation of power, independence of Judiciary. Administrative Tribunals. The Services of Bangladesh - establishment of Service Commission - function of the Commission.

LAW 201: Equitable Principles and Specific Relief

Origin and development of equity, equity and its relation to law, equity under Roman legal system, incorporation of Equitable principles in Bangladesh legal system, the general nature of equitable principles and remedies. The maxims of equity, election, satisfaction, redemption, equitable relief in contracts. Recovery of possession of immovable property, suit by person dispossessed, specific performance of Contract as a Specific Relief, contracts that can be specifically enforced and which cannot be specifically enforced. Persons for and against who contract may be specifically enforced. Discretion and powers of court. Rectification of instruments, recession of contracts. Cancellation of instrument. Declaratory decrees as Specific Relief, preventive relief, perpetual injunction, and mandatory injunction, injunction to perform negative agreement.

LAW 202: Muslim Family Law and Reforms

Legitimacy-Guardianship-Maintenance-Gift-Will-Wakf-Preemption-inheritance (Hanafi & Shia)- Statutory Laws - The Shariat Application Act, 1937. Dissolution of Muslim Marriages Act, 1939. The Child Marriage Restraint Act, 1929- Muslim Family Law Ordinance, 1961. The Muslim Marriages and Divorces (Registration) Act, 1974; Dowry Prohibition Act, 1980; Family Courts Ordinance, 1985.

LAW 203: Property Law and Transfers

The Legal rules regulating the acquisition, transfer both voluntary and involuntary and restrictions on the exercise of rights in property - heritable and moveable, corporeal and incorporeal-with particular emphasis on the effectiveness of the present rules in meeting the needs of modern society. General rules governing the transfer of movable and immovable properties by act of parties. Vested and contingent interests, transfers with conditions. Doctrine of election, doctrine of lis-pendens, fraudulent transfer, doctrine of Part Performance, sale of immovable properties, mortgages, different kinds of mortgages, foreclosure, redemption. Doctrine of marshalling, contribution, subrogation and priority. Charges, leases, exchange, gifts and transfer of actionable claims.

LAW 204: Law of Registration and Limitation

Preliminary, registration establishment, register-able documents, time of presentation, place of registration, presentation documents for registration, presenting wills and authorities to adopt, deposit of wills, effects of registration and non-registration, duties and power of registration officers, refusal to Registrar, fees for registration, searches and copies, penalties and miscellaneous. Limitation and prescription, object interpretation and application of statutes of Limitation, waiver of limitation, limitations of suits, appeals and applications, computation of period of limitation, grounds of exemption from extension of period of limitation, suspension of limitation, acquisition of ownership by possession, acquisition of easement rights, limitation in suits for recovery of land.

LAW 205: Business Law

A study of legal environment of business in Bangladesh excluding Law of Contract and Labour and Industrial Laws. The study comprises details relating to Law of Partnership, Bailment and Agency, Sales of Goods, Law of Insurance and Law of Bankruptcy.

LAW 301: Agricultural Law and Reforms

The law affecting the use of land for agriculture in Bangladesh; the law of landlord and tenant as it affects agricultural and small holdings, with particular reference to the main features, and interpretation, of the relevant legislation. Evolution of tenancy - from ancient period to the passing of The State Acquisition and Tenancy Act, 1950. Who is or who is not a rent-receiver; Special provisions for the acquisition of interests of certain rent-receivers: Special provisions regarding lands held in Lieu of service; Preparation of record of rights-assessment of compensation; Provisions relating to arrears of revenue, rent and cesses; Incidents holdings of raiyats, and transfer, purchase and acquisition of lands; provisions as to enhancement and reduction of rent; amalgamation, sub-division and consolidation of holding; Maintenance of the record of rights; Jurisdiction-Appeal, Revision and Review. Classes of non-agricultural tenants, tenants, under tenants, provisions as transfer of a non-agricultural land, improvements, other incidents of non-agricultural tenancies, judicial procedure

LAW 302: Criminal Law

General principles of responsibility for crime, essential elements of crime, guilty mind, actus reus and mens rea; defenses and mitigating factors. Grounds of exemption from criminal responsibility, joint liability, abetment and attempt of offences. Specific offences under Penal Code: Offences against the State and other public interests. Offences affecting the human body. Offences against the property and other interests of the individual. Punishment : Its objects and limits. Special law of crimes will also be discussed.

LAW 303: Company Law

The theory and principles of company law, including the meaning and consequences of incorporation, its advantages and disadvantages, the ultra vires doctrine, the concept of capital, the company's organs and agents and its liability for their actions, the rights and obligations of directors and shareholders inter se and the protection of minorities, the formation and flotation of companies, the nature and classification of company securities, publicity, accounts and audit, meeting and resolutions, reconstructions and amalgamations, Liquidation.

LAW 304: International Law [Public]

Sources - subject-relation to municipal law-recognition-law of territory, the sea, air and outer space-jurisdiction-privileges and immunities of states, international organization and their representatives-individuals in international law: nationality, aliens, human rights, extradition -law of treaties-international responsibility of states and international organizations- settlement of disputes: role of international institutions-use of force by states and international institutions-law of war and neutrality.

LAW 305: Principles of Civil Procedure

Procedural and Substantive law-organization of Civil Courts in Bangladesh, scope and application of the Civil Procedure Code, structure of the code. Inherent power of the courts, Code not exhaustive, Suits and other Civil proceedings. Jurisdiction of Courts, Institution of suits and proceeding, place of suits, Parties to suits, Service of summons of defendant, recognized agents and advocates, examination of parties, discovery, Admission, Framing of issues and interrogatories, Hearing of suits. Default of appearance and failure to prosecute. Stay of suits, Stay of Suits, Resjudicata. Bar to further suits, execution of decrees and orders, Incidental and supplemental proceeding, special procedure in particular classes of suits Pauper suits, Inter-pleader suits, Appeals from decrees and orders, Review, Revision and Reference Temporary injunction, withdrawal and adjustment of suits, commission, arrest and attachment before judgment, Appointment of receivers. Appeals to the Supreme Court of Bangladesh.

LAW 306: Evidence

Development, scope and function of the law; necessity of proof, relevancy of facts, mode of proof, production and effect of evidence, improper admission or rejection of evidence.

LAW 307: Laws on Insurance

Evolution – historical sketch, nature of the concept of insurance, governing laws, formation of the contract. Basic features / characteristics of contract of insurance. Provisions of fire insurance-Assignment of fire policies, when valid – (refer to the provisions of Secs. 49 and 135 of the Transfer of Property Act 1882), 'Average Clause' in fire policies and its effect, 'average formula' and its application. Types of fire policy-Specific policy, Comprehensive policy, Valued policy, Floating policy, Replacement or Re-instatement policy. Provisions of marine insurance. Basic characteristics of marine insurance, Classification of marine policies, various "clauses" in marine policies: Liability of Underwriter. Marine loss-Partial and Total loss, Actual total loss and Constructive total loss. Notice of abandonment, when required. Provision of life insurance. Miscellaneous /liability insurance. Provisions applicable to Insurers/underwriters/insurance Company. Bankruptcy and its effect on insurance claims. Concept of Re-insurance and Double insurance.

LAW 308: Criminal Procedure

Constitution, jurisdiction and powers of criminal courts, arrest, bail, provisions as to bonds. Prevention of offences, unlawful assemblies; investigation and inquiry, charge, trial of summons case, warrant cases and session cases. Summary trials, judgment, acquittal and conviction. Appeal, reference and revision.

LAW 401: Conveyancing and Legal Writings

Conveyancing - as an art of effecting transfers. Short history of conveyancing - Deedpoll, Indenture and Grant. Ownership of land and soil (Indian concept) - Absolute ownership.

Conveyancing in British India, capacity of conveyancing, transfers by limited owners, disqualified transferee, unborn persons, fiduciary relations between the parties, operation and restraint on transfer. Essence of drafting, requisite of Deed of Transfer - in general, registering office, time limit of presentation of documents, enforcing one to register.

LAW 402: Legal Research and Methodology [Dissertation Paper]

To associate and induct students into the culture of research work and to provide a framework in which they can develop their individual skills and talents in a stimulating research environment. Students would be exposed to variety of literature which explores the setting up of research projects, the definition of research questions, techniques for research, analysis, the development of conclusions and findings, and writing-up styles in general. To provide students with practical experience in the planning and execution of a small research project as well as the research literature towards a supervised Dissertation Paper. In the beginning of 4th year Semester VII, students would have to choose and decide the topic for their Dissertation Paper and find a Supervisor in consultation with faculty administration. The Supervisor would provide necessary scholastic support and guide to the student to accomplish and achieve the goals of presenting a decent paper. It is required that in preparing the Dissertation Paper students must adequately demonstrate research skill and legal acumen that is expected of him as a senior student of law.

LAW 403: Moot Court Sessions

Mock trials would be arranged based on hypothetical facts and cases, both in criminal a civil matters, with a view that students may acquire practical knowledge on customary behaviours of lawyers in court-room and other associated professional ethics that is expected of a lawyer of good standing. In mock trials real life situations would be created - Viz. the counsel / lawyer / Advocate of both sides would properly be dressed in accordance with the norms and practice, retired Judges of the High Court Division of the Supreme Court of Bangladesh would be invited to act as a Judge to preside over the mock trial sessions, replica witnesses be created in terms of the facts of the cases to depose and be examined and cross-examined by the counsel / lawyers of both the sides, so that art of examining and cross-examining of witness and rules prescribed thereto be demonstrated and practiced. The moot - court sessions would immensely help the young budding lawyers of Bangladesh, who normally feel shy in the beginning of their practicing life, and often get disinterested in practicing law in the court.

LAW 404: Law of Trusts and Codicils

Origin and development of trust, trust distinguished from other legal relationship. Classification and kinds of trust; creation of trust, the office of trustee, rights, powers and discretion of trustees, duties and disabilities of trust. Liability for breach of trustee and remedies of the beneficiary. Wills and its characteristic, kinds of will, wills in Mohammadan Law. Capacity to make a will, Capacity to take under a will, what may be bequeathed, probate and letters of administration, bequest to unborn persons, will in favour of a female, estates unknown to Hindu Law, power of appointment, direction of accommodation and construction of wills.

Elective Law Courses

LAW 322: Intellectual Property Law

The law of intellectual property, copyright, patents, designs, trade marks, passing off, confidential information and other forms of intellectual property in the law of intellectual property.

LAW 423: Maritime Law and Carriers

Common carriers, carriage by Railways. Carriage by air, law relating to air carriage, Warsaw convention and the Hague protocol, the documents of carriage, rights and duties, international carriage by air, internal carriage by air, the procedure of realizing damages. Carriage by sea, the contract of affreightment, charter party, the bill of lading, is the bill of lading a negotiable

Instrument? Differences between a Charter Party and a bill of lading, implied warranties, duties of a carrier by sea, liabilities of a carrier by sea, certain terms, average.

LAW 424: Inland Shipping Law

Registration and survey, inland ships to be surveyed and registered, powers of surveyors and registrars, grant of certificate of survey, duration of certificate of survey, power of government to direct survey by more than one surveyor, ownership acquired outside Bangladesh to be reported to registrar, ships when altered are to be registered, manning examination and certification - categories of inland ship, manning of inland ship, suspension and cancellation of certificate. Shipping casualties - Shipping casualties and report thereof, inquiry trial of offences. Constitution of a Marine Court, procedure of trial, arrest of witnesses, special powers of courts. Protection of vessels and passengers, effect further plying without route permit, timetable and printed ticket, voyage during storm, signal, measures for protection against explosion, fire. Carriage of dangerous goods, maximum and minimum fares and freights. Penalty and procedure, trial of offences, trial of offences by the Magistrate of the Maritime Court, Recovery of fine by distraint. Rules to regulate the carriage of passengers inland steam-vessels, Rules to regulate the towing and speed of inland steam-vessels, Rules for the protection of inland steam and motor-vessels from danger by collision.

LAW 425: Cyber Law

The course would be divided into several modules covering Introductory Concepts, Computer Concepts, Electronic Signatures, Intellectual Property Issues, Cyber Crimes, Jurisdictional issues, Data Protection and privacy. The syllabus of the course would be divided into sessions, which would be clubbed together to facilitate the student's ease of studying and understanding.

LAW 426: Legal Informatics

The course would enable students to become familiar with 'Information Technology in the arena of Law' and would denote the entire interaction between Law and IT. The course would consider the possibilities for the use of IT by lawyers and the impact of IT on legal practice. Attempted would be made to briefly introduce the students to the issues behind the concept of legal informatics -- a field that addresses the application of information technologies in the practice of law. To find out how the traditional roles of attorneys, law librarians, and systems personnel in law offices are being re-defined in an increasingly networked, electronic environment. Students would be exposed to the most current electronic technologies that are used to enhance the functions of litigation and issues arising from their use, and would encompass topics, such as Litigation support / imaging, Electronic filing, Brief banks, form files, and in-house research banks (how to use technology to help avoid re-inventing the wheel) and Telecommuting or bringing your network with you on the road.

LAW 331: Banking and Securities Law

Laws of Banking in Bangladesh, Relation between banker and customer. Customer's Accounts, With Bankers, Special Types of Banker's Customers, Negotiable Instruments, Cheques, Payment of Cheques, collection of Cheques, loans and advances. Secured advances. Modes of creating Charge. Secured advances, Types of Securities. Letters of Credit and Guarantees. Business of Banking Companies, Illegal banking transactions - the powers of Bangladesh Bank, prohibition of certain activities by the Banking Companies, suspension and winding-up of banking Companies and others. Historical Background of Securities Law - British India prospective, Power of Securities Exchange Commission (SEC), regulation on issuance, prohibitions and restrictions. Constitution and functions of Securities and Exchange Commission. Stock Exchange Rules. Concept of insider trading - Chinese walls, positions in USA, UK and Bangladesh. Different relevant Rules and Regulations.

LAW 332: Laws on Foreign Exchange, Investment and Anti-money Laundering

Specific laws regulating payments and dealings in foreign exchange, securities and import and export of currency / bullion. Laws providing promotion and protection to foreign (private)

investment in Bangladesh, duties of the Bangladesh Bank to restrain/control and protect money-laundering offences - right of investigation. Constitution and powers of Money Laundering Court - right of passing confiscation and freezing orders, appeals against such orders, punishment for money laundering offences.

LAW 433: Public Demand Recovery and Money Loan Court Act

Preliminary, filing, service and effect of certificates and hearing of objections thereto. Executions of certificate attachment, sale, setting - aside sale disposal of sale proceeds. Arrest, detention and release. Reference to civil court, supplementary provisions. Constitution, power and jurisdiction of money loan court. Filing of suits, rules and method of trial, Settlement conference - mediation. Appeal and revision, miscellaneous.

LAW 434: Taxation Law including Customs and VAT

An introduction to the law of direct and indirect taxation as applied to Bangladesh, objectives of fiscal policy in developed and undeveloped economy, compensatory fiscal policy, contra cyclical fiscal policy, crowding out effect, automatic stabilization, Limitations of fiscal policy in Bangladesh. Public and private finance, importance of public finance, causes of growth of public expenditure in modern firms-its related theory, effect and limits of Government expenditure, objectives and principle of taxation, good tax system, canons of taxation, characteristics, classifications of income and their effects, exemptions. Income year, assessment year, assessment, reassessment, advance payment proceedings, set off and carry forward for losses, tax evasion and tax avoidances. Income tax authority, methods of computing income and allowable deductions under each head. Law of gift tax. Law of wealth tax. Particular emphasis would be placed on the law of Fiscal measures, income-tax, gift tax and value added tax on goods and service.

LAW 435: Labour and Industrial Law

Definition of Worker, formation of the contract of service, conditions of employment and classification of workers, leave and holidays, stoppage of work, lay off, retrenchment, fine, discharge, dismissal, punishment Procedure, termination of employment, grievance procedure, penalties and procedure. The Law of Trade Unions: Role, function and utility of trade unions, rights and privileges of registered trade unions and collective Bargaining Agents, unfair labour practices. Settlement of disputes: Origin of labour legislation, right to strike and lockout, industrial disputes and their settlement through negotiation, conciliation, arbitration and by Labour Courts, constitution, function and power of Labour Courts and the Labour Appellate Tribunal. Fixing of right to wages, payment of wages, deductions and claims. Factories Law: Early factory legislation, health, hygiene, welfare, working hours, overtime employment of young person and female, leave and holidays Penalties. Shops and Establishment Law: Working hours, leave and holidays, provision for health and hygiene, penalties. Workmen's Compensation: Accidents and diseases, fatal accidents, employers' liability for compensation and the procedure for its determination, the functions of the commissioners.

LAW 341: Comparative Law

Nature, classification, origin and development of comparative law, importance and utility of comparative law, weakness of comparative law, comparative law and conflict of laws, major legal systems, comparison between organizations and systems of courts in common law and civil law countries, comparative approach to the sources of law.

LAW 342: Legal Systems and Institutions

A critical introduction to the legal system of the than British India and Bangladesh, and to the study of law more generally in its historical, philosophical and social context. Its coverage includes legal theory, legal reasoning, the judicial process, law and justice, the sources of law, legal history, the administration of justice, jurisdiction and procedure. The Charter Act of 1833: Law commission; codification: Influence of English law in India. Introduction of the doctrine of equity, justice and good conscience, the Gentoo code. Customary law and codification. Personal laws of

Muslims and Hindus. The Indian High Courts Act 1861. Constitutional Acts 1861-1947. Growth of legal profession in India before 1947. History of the Privy Council and its necessity. The Federal Court.

LAW 343: Criminology and Penology

The course will develop students' knowledge of law and legal systems with respect to criminal law enforcement. The legal context will be studied in relation to its broader social and cultural embeddedness. The Science of Criminology: Criminology and criminal law, perspective and methods in criminology, physiological and racial factors and crime, Psychological theories of criminal behavior, social factors and crime-influence of home and family, social and religious instruments of crime, causes of crime - viewing the problem as a whole. The control of crime: The nature of punishment and the penal system, the treatment of criminals in borstal, the approved schools, probation, detention before trial, parole, the Juvenile Court, prison training, prevention of crime and delinquency.

LAW 344: Alternative Dispute Resolution (ADR) and Arbitration

Concept of Alternative Dispute Resolution (ADR). Origin and development, ADR concept in British India. Different advantages of ADR in contrast to litigations. Factors necessary for its success. Alternative Dispute Resolution (ADR) and court system. ADR techniques - negotiation, mediation / conciliation, mediation - arbitration (MED-ARB), mini-trial, arbitration, first track arbitration etc. Arbitration - advantages, implied provisions in an Arbitration, powers and duties of an Arbitrator, Award and Enforcement of award, settings-aside an award. Arbitration superseded by the court. Appeal. Dispute resolution within and outside court - US experiences. International mediation - UK experiences.

LAW 345: Women, Law and Legal Protection

In our society women have become a weaker section of the human population. In many instances their functions have been relegated to mere procreation and attending to household chores. Her life is so structured that she has become sub-servient to the needs of man and has become a victim of social and personal aggression, even in the era of equality of sexes, equality before law and equal protection of laws through constitutional guarantees. It is ironical that cruelty to the women and problem of battered wives have become almost a worldwide phenomenon. Domestic violence occurs all over the world on a significant and disturbing scale. In the context of the above scenario the course will deal with the social and legal status of women, enactments and laws that ameliorate their lot and prevent exploration and discrimination.

LAW 346: Environmental Law

An introduction to the law (in international and national perspective) related to the protection of the environment. Emphasis is placed not only on selected subject areas (e.g. nature conservation, integrated pollution control) but also on the study of different strategies of environmental protection and their enforcement. International Developments – International environmental legal issues – regional environmental developments – international environmental institutions.

LAW 447: Human Rights

Concepts, development of international human right law, international human rights instruments, regional human rights instruments. Role of Non-Governmental Organization (NGOs), in the promotion of human rights with special reference to Bangladesh.

LAW 448: Administrative Law

Administrative Law - Definition, nature, scope, causes of growth with special reference to Bangladesh. Droit Administratif. Important concepts in Administrative Law - Concepts of Rule of law, Concept of Natural Justice, doctrine of Ultra Vires, concept of public interest litigation. Administrative action - Classification - Quasi - legislative Action, Quasi - judicial Action, Purely Administrative Action, Control mechanism, Judicial Review - principles and modes. Administrative

Discretion, Administrative Arbitrariness. Liability of Administration - Liability of Administration in Tort and Contract, Privileges and immunities of Administration in suits, Immunity from state operation and estoppels, other privileges. Statutory Public Corporations - Chief characteristics, liability in Tort and contract, rights and privileges, control mechanism. Administrative fault - Special Remedies. Tribunals, ombudsman, discretion to disobey.

LAW 351: Hindu Law and Succession

Origin, sources and operation of Hindu law, schools of Hindu law, persons governed by Hindu law, the Doctrine of Factum Valet. Joint family, Dayabhaga joint family, Debts-grounds of liability, debts under the Dayabhaga law, Partition - how partition is effected. Women's estate. Marriage, divorce, succession, adoption and maintenance.

LAW 352: Succession, Social Policy and Law Reforms

Law of inheritance in personal laws, amendments and reforms thereto and its effects on social policy.

LAW 352: Law of Town Planning and Environment

Rules in relation to town planning and land development, establishment of RAJUK, its power and functions, introducing improvement skills and re-housing scheme along with power of acquisition, disposal of land and compulsory acquisition, its effect on environment.

LAW 453: Construction Laws

Law relating to construction in Building in Bangladesh, restrictions and requirement thereon, under the Building Construction Act 1952 and amendment thereafter in 1990 along with Building Construction Rules 1996.

