Academic Rules and Regulations for Postgraduate Programs

1. Definitions:

(i) 'University' means the Dhaka University of Engineering & Technology, Gazipur abbreviated as DUET, Gazipur.

(ii) 'Syndicate' means the Syndicate of the University.

(iii) 'Academic Council' means the Academic Council of the University.

(iv) 'Vice-Chancellor' means the Vice-Chancellor of the University.

(v) 'Pro-Vice Chancellor' means the Pro-Vice Chancellor of the University.

(vi) 'Faculty' means the Faculty of the University.

(vii) 'Dean' means the Dean of the Faculty of the University.

(viii) 'Department' means the Department of the University.

(ix) 'Head' means the Head of the Department of the University.

(x) 'Registrar' means the Registrar of the University.

(xi) 'Controller' means the Controller of Examinations of the University.

(xii) 'CASR' means the Committee for Advanced Studies and Research of the University.

(xiii) 'ECF' means the Executive Committee of the Faculty of the University.

(xiv) 'ACPG' means the Academic Committee for the Postgraduate Program of a Department of the University.

(xv) 'Equivalence Committee' means the Committee for determining the equivalency of Undergraduate and Postgraduate Degrees obtained from other Universities.

(xvi) 'Semester' means program of study to be completed within a specific period of time, an Academic Year will consist of two semesters.

(xvii) 'Board of Discipline' means Board of Discipline (ছাত্র শৃঙ্খলা কমিটি) of the University.

2. Committee:

2.1 Committee for Advanced Studies and Research (CASR):

2.1.1 The CASR shall consist of the following members:

(i)	Vice-Chancellor or his/her nominated person;	Chairman
(ii)	Pro-Vice Chancellor;	Member
(iii)	Three Professors of the University to be nominated by the Syndicate;	Member
(iv)	Three Teachers of the University having research capabilities and experience to be nominated by the Academic Council not below the rank of Associate Professor;	Member
(v)	Two Experts from outside the University to be nominated by the Vice-Chancellor;	Member
(vi)	Director (Research & Extension).	Member Secretary

2.1.2 At least 50% of members will fulfill the quorum.

2.1.3 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.1.4 The functions of the Committee shall be as follows:

(i) to recommend the concerned authorities for promotion of research and development of advisory and extension services of the University;

(ii) to approve the proposals for research, advisory and extension services submitted by the different Departments of the University;

(iii) to approve the Doctoral Committee;

(iv) to approve the Teacher/Expert's name for supervision of research;

(v) to recommend the Academic Council about the Board of Examiners for research evaluations;

(vi) to do such other acts as may be assigned or referred to it by the Vice-Chancellor, the Academic Council or the Syndicate.

2.2 Executive Committee of Faculty (ECF):

2.2.1 The ECF shall consist of the following members:

(i)	Dean of the Faculty;	Chairman
(ii)	All Heads under the Faculty;	Member
(iii)	All Professors and Associate Professors under the Faculty;	Member
(iv)	Three Teachers of the University from outside the Faculty (closely related to the subjects) nominated by the Academic Council;	Member
(v)	Two Experts, having experience in one or more relevant field but not working at the University to be nominated by the Academic Council.	Member

2.2.2 The Chairman will nominate one of the members as mentioned in Article no. 2.2.1(iii) to act as the Member Secretary.

2.2.3 At least 50% of members will fulfill the quorum.

2.2.4 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.2.5 The functions of the Committee shall be as follows:

(i) to select the courses, syllabuses and marks to award Postgraduate Degrees;

(ii) to recommend the Academic Council about the requirements for degree, diploma, certificate and other honors;

(iii) to recommend the Academic Council to create/restructuring posts for the Teacher and Researcher of the concerned Departments under the Faculty;

(iv) to take necessary actions as may be conferred on it by Academic Council.

2.3 Academic Committee for the Postgraduate (ACPG) Program:

2.3.1 The ACPG shall consist of the following members:

(i)	Head of the Department;	Chairman
(ii)	All Professors and Associate Professors of the Department and all other Teachers offering Postgraduate courses;	Member
(iii)	One Professor from the relevant field from any other University/Institute to be nominated by the Vice-Chancellor;	Member
(iv)	One Expert from the relevant field having experience in any industry, research or commercial organization to be nominated by the Academic Council.	Member

2.3.2 The Chairman will nominate one of the members as mentioned in Article no. 2.3.1(ii) to act as the Member Secretary.

2.3.3 At least 50% of members will fulfill the quorum.

2.3.4 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.3.5 The functions of the Committee shall be as follows:

(i) to formulate and review the courses and syllabuses to award Postgraduate Degrees;

(ii) to propose the names of paper setters and examiners for different Postgraduate examinations to the Vice-Chancellor;

(iii) to perform such other functions as may be conferred on it by ECF, Academic Council, Syndicate and the University Act.

2.4 Equivalence Committee:

2.4.1 The Equivalence Committee shall consist of the following members:

(i)	Vice-Chancellor or his/her nominated person;	Chairman
(ii)	Pro-Vice Chancellor;	Member
(iii)	Dean of the Faculties;	Member
(iv)	Head of the Department;	Member
(v)	Two Professors of the University to be nominated by the Academic Council;	Member
(vi)	One Professor of the University to be nominated by the Vice-Chancellor.	Member

2.4.2 The Chairman will nominate one of the members as mentioned in Article no. 2.4.1(iv) or (v) to act as the Member Secretary.

2.4.3 At least 50% of members will fulfill the quorum.

2.4.4 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.4.5 The functions of the Committee shall be as follows:
(i) to assess the Degrees obtained from other Universities/ Institutes;

3. Postgraduate Course Co-ordinator:

The Member Secretary of the ACPG of the Department of Chemistry will act as the Postgraduate Course Co-ordinator of the Department. The Course Co-ordinator should coordinate all the related activities regarding the Postgraduate program and will preserve all the related documents and records.

Academic Rules and Regulations for M Sc. and M Phil. Degree

1. Degree Offered

The Masters Degrees to be offered by the Department under the rules and regulations are as follows:

1.1 Master of Science in Chemistry abbreviated as M Sc. (Chem.)

1.2 Master of Philosophy in Chemistry abbreviated as M Phil. (Chem.)

1.3 Any other Masters Degree approved by the Syndicate on the recommendation of Academic Council may also be offered under the Rules and Regulations.

2. Eligibility for the Applicant

2.1 In order to get admission to the M Sc. Degree an applicant

a) must have a minimum GPA of 3.00 out of 5.00 or 2.75 out of 4.00 or a first division in SSC or HSC or Diploma in Engg. or in equivalent examinations; and

b) must have a minimum CGPA of 2.75 out of 4.00 or its equivalent in four-year B Sc. Degree or equivalent in the relevant branch.

2.2 In order to get admission to the M Phil. Degree an applicant

a) must have a minimum GPA of 3.00 out of 5.00 or 2.75 out of 4.00 or a first division in SSC or HSC or Diploma in Engg. or in equivalent examinations; and

b) must have at least 50% marks or a minimum CGPA of 2.75 out of 4.00 or equivalent both in B Sc. Degree with Masters Degree or its equivalent in the relevant branch.

2.3 The above requirements may be relaxed for applicants on deputation or sponsored by Academic Institutions/Research Organizations/International Organizations. Such relaxation shall be recommended by the Admission Committee of the Department of Chemistry for approval of Academic Council.

2.4 Specific requirements for the Department of Chemistry are that an applicant must have a four-year B Sc. Degree or M Sc. Degree with B Sc. Honours in Chemistry or its equivalent. An applicant with M Sc. Degree but not having a B Sc. Honours Degree in Chemistry or Applied Chemistry must have a first class (or equivalent) in the M Sc Degree.

Or

B Sc. Degree in Engineering discipline or its equivalent.

3. Admission and Registration Procedures

3.1 Applications for admission to the above programs shall be invited through regular means of advertisement and shall be received by the Registrar office.

3.2 On the recommendation of the ACPG of the Department of Chemistry through EC of the Faculty of Engineering, the rules for admission into the University for Postgraduate Program shall be framed by the Academic Council from time to time. CASR on its own may, if it deems fit, recommend such rules for admission for approval of the Academic Council.

3.3 There shall be an Admission Committee in the Department of Chemistry as constituted by the ACPG of the Department on the recommendation of the Head of the Department.

3.4 Before being finally selected for admission an applicant may require to sit for an oral and/or written test before the Admission Committee. S/he may require to take pre-requisite course(s) as may be prescribed by the Admission Committee.

3.5 The selected applicants should complete their course registration and related tasks as per the announcement of the Registrar office of the University.

4. Academic Requirements and Regulations

4.1 a) The minimum duration of the M Sc. Program shall be 3 (Three) semesters and generally not more than 5 (five) Academic Years starting from the date of first registration. Each Academic Year shall consist of two semesters. The duration of a semester will be of minimum 13 (thirteen) weeks.

b) The minimum duration of the M Phil. Program shall be 4 (four) semesters and generally not more than 5 (five) Academic Years starting from the date of first registration. Each Academic Year shall consist of two semesters. The duration of a semester will be of minimum 13 (thirteen) weeks.

4.2 The courses of a Program in the Department of Chemistry shall be proposed by the ACPG of the Department and approved by the Academic Council on the recommendation of the EC of the Faculty of Engineering.

4.3 The courses to be offered by the Department of Chemistry in any semester shall be determined by the Department.

4.4 Academic progress of a student shall be assessed in terms of credit hours earned by them. In a semester 1 (one) hour per week theory course or 3 (three) hours per week Thesis represent(s) 1 (one) Credit hour. The number of credit hours for each course shall be specified in the syllabus of the Department of Chemistry.

4.4.1 For the Degree of M Sc. in Chemistry, a student must earn a minimum of 36 Credit hours of which 18 Credit hours shall be assigned for a Thesis.

4.4.2 For the Degree of M Phil. in Chemistry, a student must earn a minimum of 48 Credit hours of which 30 Credit hours shall be assigned for a Thesis.

4.5 A student may be allowed to switch from M Sc. to M Phil. on the recommendation of the ACPG of the Department of Chemistry through Head of the Department before the commencement of a semester.

4.6 A student may be allowed to switch from M Phil. to M Sc. on the recommendation of the ACPG of the Department of Chemistry through Head of the Department and concerned Supervisor upon having the approval of the CASR before the commencement of a semester.

4.7 There shall be two categories of student, namely, full-time student and part-time student.

4.8 A full-time student must register a minimum of 12 (twelve) Credit hours and a maximum of 15 (fifteen) Credit hours per semester. If a full-time student gets an employment while continuing the program, s/he can continue the program as a part-time/full-time student with the written permission or leave from the employer.

4.9 A student, serving in different organizations, may be admitted as part-time student with a written consent of the employer. A part-time student may be allowed to register a maximum of 9 (nine) credit hours in a semester.

4.10 A student may be allowed to switch from part-time to full-time or vice-versa on the recommendation of the ACPG of the Department of Chemistry through the Head of the Department before the commencement of a semester.

4.11 A student may be permitted to withdraw and/or change their registered courses within 3 (three) working weeks from the commencement of that semester on the recommendation of the Course Co-ordinator and the Head of the Department. The concerned course Teacher and authorities will be informed of the decision.

4.12 On the recommendation of the ACPG of the Department of Chemistry through CASR and by the approval of the Academic Council, a student may be allowed to transfer a maximum of 9 (nine) Credits for M Sc. and 15 (fifteen) Credits for M Phil. of the required theory courses of this Department completed by the student at a recognized University/Institute provided that the courses were not taken earlier than 3 (three) calendar years from the date of their first enrollment in the respective program at the University. In addition, the student must obtain a minimum GPA of 3.00 out of 4.00 or its equivalent and those courses should be equivalent to the theory courses offered at the Department.

4.13 If a student is unable to complete the final examination of a semester due to serious illness or serious accident or official commitment, s/he may apply to the Registrar in a prescribed form through the Head of the Department of Chemistry for total withdrawal from the semester within a week after the end of the semester final examination. The application must be supported by a medical certificate from the Chief Medical Officer (CMO), DUET or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the ACPG of the Department.

4.14 The qualifying requirement for graduation is that a student must earn a minimum CGPA of 2.65 based on the weighted average of their course work.

4.15 2 (two) courses may be repeated for improvement with the prior approval of the Head of the Department on the recommendation of the Course Co-ordinator, provided that the student has a CGPA less than or equal to 2.65. In such cases, the better grade(s) amongst the previous examination and improvement examination would be retained.

4.16 A student shall not be allowed to continue the Program if s/he obtains a total of 4 (four) or more 'F' grades during the period of their studies.

4.17 If at the end of the second or any subsequent semester, the cumulative GPA falls below 2.50, s/he shall not be allowed to continue the Program.

4.18 In addition to the successful completion of theory course work, each student shall have to submit a Thesis on their research work fulfilling the requirements as detailed in the subsequent Article no. 7.

5. Grading System

5.1 The grading system for assessing the performance of a student in credit courses shall be as follows:

Numerical grade	Letter grade	Grade point	Merit description
90% and above	A plus	4.00	Excellent
>80% but <90%	A regular	3.50	Very good
>70% but <80%	B plus	3.00	Good
>60% but <70%	B regular	2.50	Average
>50% but <60%	C	2.00	Pass
below 50%	F	0.00	Failure
	I		Incomplete
	S		Satisfactory
	U		Unsatisfactory
	X		Continuation

All the final grades for the course of M Sc. and M Phil. will be recorded in letter grade system. The Grade Point Average (GPA) shall be computed for each semester. The GPA will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

where, n is the number of courses passed by the student during the semester, C_i is the number of Credits allotted to a particular course and G_i is the grade point corresponding to the grade awarded for that course(s). The overall or Cumulative GPA gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing total grade points ($\sum C_i G_i$) accumulated up to the date by the total credit hours ($\sum C_i$). Both GPA and Cumulative GPA will be rounded off to the second place of decimal for representing/reporting.

5.2 Course(s) in which a student gets 'F' grade shall not be counted towards Credit hour requirements and for the calculation of GPA. Students may repeat the 'F' graded course(s) if it is offered again.

5.3 The 'B' and 'C' grades, up to a maximum of two courses, may be ignored for calculation of GPA on the written request of the student to the Head of the Department and on the recommendation of the Course Co-ordinator, provided that the student has to fulfill the total course credit hour requirements in the remaining courses with a minimum GPA of 2.65.

5.4 The performance in all the courses including all the 'F' grades shall be reflected in the transcript.

5.5 Grade 'I' will be given only when a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond of their control. To get 'I' grade, s/he must apply to the Head of the Department through the respective course Teacher within 1 (one) week after the examination of the respective course. S/he has to complete the course within the next 2 (two) consecutive semesters; otherwise s/he will get 'F' grade in that course. If that course is not offered within the next 2 (two) consecutive semesters, the student can take any other offered course as a replacement on the recommendation of ACPG. A student can apply for an 'I' grade for a maximum of 4 (four) same/different courses.

5.6 Satisfactory ('S') and Unsatisfactory ('U') shall be used for final grading of the performance of Thesis and non-credit courses. An 'X' grade shall be recorded for Thesis continuation.

5.7 A student may enroll for non-credit course(s) termed as audit course(s) on the recommendation of their Thesis Supervisor and Head of the Department.

6. Conduct of Examination

6.1 In addition to class tests, assignments, term papers, etc. there shall be a written examination on all theoretical courses at the end of each semester. The respective course Teacher will be solely responsible for the performance evaluation of a student. The dates of the examinations shall be announced by the Controller of

Examinations as advised by the Head of the Department at least 2 (two) weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term papers, etc. and written examination.

6.2 The Controller of Examinations shall keep the up-to-date record of all the grades obtained by students and shall publish the results at the end of each semester. A student may collect a copy of the grade sheet from the office of the Controller of Examinations at the end of each semester. In addition, each student is entitled to 1 (one) official academic transcript after the completion of their academic program from the office of the Controller of Examinations on production of document of clearance from all concerned Departments and payment of the prescribed fees.

6.3 The ACPG of the Department of Chemistry shall recommend the names of the paper setters and examiners for the semester final examinations at least 2 (two) weeks before the date of the commencement of the examination to the Vice-Chancellor for approval.

7. Thesis

7.1 The research work for a Thesis shall be carried out under the Supervision of a full-time teacher, who should be the member of ACPG of the Department of Chemistry. A Joint-supervisor/ Co-supervisor within or outside the Department may be appointed (if necessary). The Supervisor, Joint-supervisor/ Co-supervisor and the research topic shall be approved by the CASR on the recommendation of ACPG after completion of at least 12 (twelve) Credit hours of course work and having a minimum CGPA of 2.65.

7.2 A student shall submit a Thesis proposal to the ACPG through Supervisor. The ACPG shall examine the proposal and recommend it for the approval of the CASR through the Head of the Department. In special circumstances, the ACPG may recommend any subsequent changes in the research topic and forward it through the Head of the Department to CASR for further approval.

7.3 If any change is necessary on the approved Thesis (title, content, cost, Supervisor, Joint-supervisor/Co-supervisor, etc.), it shall be approved by the CASR on the recommendation of the ACPG of the Department of Chemistry.

7.4 The research work should normally be carried out at the University. However, if necessary, with the approval of the ACPG, the Supervisor can allow their student to carry out the research work outside the University.

7.5 At the end of a student's research work and with the consultation of the Supervisor the student has to submit a Thesis which must be an original contribution to Engineering/Science and worthy of publication. Each student must submit at least 5 (five) numbers of printed copies of their Thesis in the prescribed format to the Head of the Department on or before a date to be fixed by the Supervisor concerned in consultation with the Head of the Department.

7.6 The student shall have to declare that the research work was carried out by them and has not been submitted elsewhere for the award of any other Diploma or Degree.

7.7 The Thesis should reflect a satisfactory knowledge in the field of research undertaken by the student.

7.8 Each student submitting a Thesis in partial fulfillment of the requirements of a Degree, shall be required to take an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the Head of the Department and must satisfy the examiners that s/he is capable of intelligently applying the results of their research to the solution of problems, of undertaking independent work, and also shows evidence of satisfactory knowledge related to the theory and technique used in their research work.

7.9 An Examination Board for each student for Thesis and oral examination shall be approved by the Academic Council through ACPG and CASR on the recommendation of the Thesis Supervisor. The Supervisor shall act as the Chairman and the Head of the Department will be an Ex-officio member of the Examination Board. The Board shall consist of at least 5 (five) members including the Head of the Department and the Supervisor. The Examination Board shall be constituted as follows:

(i)	Supervisor	Chairman
(ii)	Joint/Co-supervisor (if any)	Member
(iii)	Head of the Department	Member (Ex-officio)
(iv)	At least one Teacher from the ACPG of the Department of Chemistry	Member
(v)	One external member from outside the University/Department.	Member (External)

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

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

8. Cancellation of Admission

The admission of a student shall be cancelled from the University on the following grounds:

(i) Non-payment of fees of the University and the Halls of residence within a prescribed period.

(ii) If the requirements in Article no. 4.16 and 4.17 are not fulfilled by the student.

(iii) Forced to discontinue their studies by the Board of Discipline.

(iv) Withdrawn officially from all the courses including Thesis.

9. Academic Fees

Academic tuition and fees will be declared and reviewed by the appropriate authority of the University from time to time.

10. Extension of Time for Completion of Degree

The application for extension of time span of a student should be approved by the Academic Council through CASR on the recommendation of the ACPG of the Department of Chemistry. A prescribed form may be used for this purpose. The application must be submitted before the normal time span has elapsed.

Academic Rules and Regulations for Doctor of Philosophy (Ph. D) Degree

1. Degree Offered

The Doctor of Philosophy (Ph. D) Degree to be offered by the Department of Chemistry under the Rules and Regulations are as Follows:

Doctor of Philosophy (Ph. D) in Chemistry abbreviated as Ph. D (Chem).

2. Eligibility for the Applicant

2.1 In order to get admission to the Ph. D program an applicant

a) must have a minimum GPA of 3.00 out of 5.00 or 2.75 out of 4.00 or a first division or equivalent in SSC or HSC or Diploma in Engg. or in equivalent examinations; and

b) must have at least 50% marks or a minimum CGPA of 2.75 out of 4.00 or its equivalent in B Sc. Engg./Four-year B Sc. Degree or M Sc. Degree in the relevant branch.

c) must have a minimum CGPA of 2.75 out of 4.00 or its equivalent in Masters Degree in the relevant branch.

d) The above requirements may be relaxed for applicants on deputation or sponsored by Academic Institutions/ Research Organizations/International Organizations. Such relaxation shall be recommended by the Admission Committee of the Department of Chemistry for approval of Academic Council.

2.2 Specific requirements for the Department of Chemistry are that: The minimum qualification for admission shall normally be M Sc./M Phil. Degree in Chemistry or its equivalent from any recognized Institution.

Or

Masters Degree in Engineering discipline or its equivalent.

3. Admission and Registration Procedure

3.1 An applicant may apply to the Registrar for provisional admission to the Ph. D program in any semester.

3.2 There shall be a Admission Committee in the Department as constituted by the ACPG on recommendation of the Head of the Department of Chemistry.

3.3 A selected applicant by the Admission Committee shall be provisionally admitted and may be required to pass the prerequisite non-credit courses as prescribed by the Admission Committee.

3.4 The selected applicants should complete their course registration and related tasks as per the announcement of the Registrar office of the University.

4. Appointment of a Supervisor

On provisional admission, the Admission Committee as constituted in Article no. 3.2 shall submit a name of a Supervisor who shall be a full-time faculty member belonging to the Department of Chemistry and a Joint-supervisor/Co-supervisor from within or outside the Department (if necessary). These selections have to be approved by the CASR. The supervisor shall prescribe a plan of study to be undertaken by the student and supervise the progress of the candidate's work.

5. Final Registration

A provisionally admitted student shall be deemed to be eligible for final registration as a Ph. D student with effect from the date of their provisional admission after s/he passes the comprehensive examination.

6. Academic Requirements for the Degree

6.1 A student must complete all requirements for the Ph. D Degree within a maximum of 7 (seven) academic years (session) and not less than 3 (three) academic years (session) from the date of their provisional admission.

6.2 Academic progress shall be assessed in terms of Credit hours earned by a student. One Credit hour subject shall normally require 13 (thirteen) weeks of lecture for one semester while one Credit hour for Thesis work should normally require 39 (thirty nine) hours of research work for one semester. The number of Credit hours for each course shall be as specified in the syllabus of the Department of Chemistry.

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

6.4 There shall be two categories of student, namely, full-time student and part-time student.

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

6.4.2 A full-time student must register for a minimum of 12 (twelve) Credit hours and a maximum of 15 (fifteen) Credit hours per semester. A full-time student shall not be allowed to be in the employment of any organization (even as a part-time employee). However, they may be employed as Teaching/Research Assistant at the University. If a full time student becomes an employee (full time or part time) of any other organization in the middle of a semester, s/he may, with the approval of the Head of the Department and their Employer, be allowed to continue as a full-time student for that semester.

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

6.5 The courses of study in the Department shall be as recommended by the ACPG of the Department of Chemistry and the Faculty/CASR and approved by Academic Council.

6.6 The courses that may be offered in any semester shall be as decided by the Department of Chemistry.

6.7 A student on the recommendation of the ACPG of the Department of Chemistry and as approved by the CASR may be allowed to transfer a maximum of 3.0 Credits of the courses completed by the student at a recognized institution provided that the courses were not taken earlier than 5 (five) calendar years from the date of their first enrollment in the respective program at DUET and that the student obtained a minimum GPA of 3.00 out of 4.00 or its equivalent in such courses and that the courses are equivalent to the approved courses of DUET

7. Grading System

7.1 The grading system for assessing the performance of a student in credit courses shall be as follows:

Numerical grade	Letter grade	Grade point	Merit description
90% and above	A plus	4.00	Excellent
>80% but <90%	A regular	3.50	Very good
>70% but <80%	B plus	3.00	Good
>60% but <70%	B regular	2.50	Average
>50% but <60%	C	2.00	Pass
below 50%	F	0.00	Failure
	I		Incomplete
	S		Satisfactory
	U		Unsatisfactory
	X		Continuation

All the final grades for the course of Ph. D will be recorded in letter grade system. The Grade Point Average (GPA) shall be computed for each semester. The GPA will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

where, n is the number of courses passed by the student during the semester, C_i is the number of Credits allotted to a particular course and G_i is the grade point corresponding to the grade awarded for that course(s). The overall or Cumulative GPA gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing total grade points ($\sum C_i G_i$) accumulated up to the date by the total Credit hours ($\sum C_i$). Both GPA and Cumulative GPA will be rounded off to the second place of decimal for representing/reporting.

7.2 The course(s) in which the student gets 'F' grade shall not be counted towards Credit hour requirements and for the calculation of Grade Point Average (GPA).

7.2.1 The 'B' and 'C' grades, up to a maximum of two courses, may be ignored for calculation of GPA at the written request of the student to the Head of the Department on the recommendation of supervisor provided that the student has fulfilled the total course Credit hour requirements in the remaining courses with a minimum GPA of 2.75.

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

7.2.3 The performance in all the courses including all the 'F' grades shall be reflected in the transcript.

7.3 Grade 'I' is given only when a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond their control. To get 'I' grade s/he must apply to the Head of the Department through the respective course teacher within one week after the examination of the respective course. S/he has to complete the course within the next 2 (two) consecutive semesters; otherwise s/he will get 'F' grade in that course.

7.4 Satisfactory ('S') and Unsatisfactory ('U') shall be used for final grading of the performance of Thesis and non-credit courses. An 'X' grade shall be recorded for Thesis continuation.

7.5 A student may enroll for non-credit course(s) termed as audit course(s) on recommendation of their Thesis Supervisor and Head of the Department.

7.6 A student shall withdraw officially from a course within 2 (two) working weeks of the commencement of the semester or else their grade in that course shall be recorded as 'F' unless s/he is eligible to get a grade of 'I'. A student may be permitted to withdraw and change their course within the specified period with the approval of their Supervisor, Head of the Department and the respective teacher(s) concerned. (In that case their grade in the courses registered shall be recorded as 'W' in his Academic Record but shall not be reflected in the transcript).

8. Doctoral Committee

A Doctoral Committee for each student shall be proposed by the Supervisor in consultation with the Head of the Department. The committee shall be approved by the CASR on recommendation of the ACPG. The Committee shall be formed within 1 (one) year from the date of the student's provisional admission. The Committee shall consist of at least five members but shall not exceed seven including the Head of the Department and the Supervisor. The Doctoral Committee shall be constituted as follows:

(i)	Supervisor	Chairman
(ii)	Joint/Co-supervisor (if any)	Member
(iii)	Head of the Department	Member (Ex-officio)
(iv)	At least two Teachers from the ACPG of the Department of Chemistry	Member
(v)	At least one external member from outside the University/Department.	Member (External)

The Doctoral Committee should meet from time to time on the request of the Supervisor to review the progress of the student. Under special circumstances CASR may approve any addition and/or alteration in the Doctoral Committee on the recommendation of the Supervisor through the Head of the Department.

9. Research Proposal

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

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

10. Conduct of Examination

10.1 In addition to class tests, assignments, term papers etc. there shall be a written examination on all theoretical courses at the end of each semester. The respective course teacher will be solely responsible for the performance evaluation of a student. The dates of the examinations shall be announced by the Controller of Examinations as advised by the Head of the Department at least 2 (two) weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term paper and written examination.

10.2 The Controller of Examinations shall keep the up-to-date record of all the grades obtained by students and shall publish the results at the end of each semester. A student may collect a copy of the grade sheet from the office of the Controller of

Examinations at the end of each semester. In addition, each student is entitled to 1 (one) official academic transcript after the completion of their academic program from the office of the Controller of Examinations on production of the document of clearance from all concerned Departments and payment of the prescribed fees.

10.3 The ACPG of the Department of Chemistry shall recommend the names of the paper setters and examiners for the semester final examinations at least 2 (two) weeks before the date of the commencement of the examination to the Vice-Chancellor for approval.

11. Qualifying Requirements

11.1 Course Work

To qualify for the degree a student must earn a minimum Grade Point Average (GPA) of 2.75 out of 4.00 based on the weighted average of Grade Points (GP) in their course work.

11.1.1 2 (two) courses may be repeated for improvement with the prior approval of the Head of the Department on the recommendation of Supervisor.

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

11.2 A student shall not be allowed to continue the program if s/he obtains a total of 2 (two) or more 'F' grades in one or more than one courses taken together, during the period of their studies.

11.3 Comprehensive Examination

The date(s) and time of the comprehensive examination shall be fixed by the Doctoral Committee on the request of the Supervisor. The comprehensive examination shall be held after the completion of the course work by the student. The theory courses should be completed within 3 (three) semesters.

The comprehensive examination shall comprise a written examination and/or an oral examination to test the knowledge of the student in their field of study and research.

The Doctoral Committee shall conduct the comprehensive examination. If a student fails in a comprehensive examination s/he shall be given one more chance to take the examination as scheduled by the Doctoral Committee.

11.4 In addition to successful completion of course works and comprehensive examination every student shall submit a Thesis/Dissertation on their research work fulfilling the requirements.

12. Thesis/Dissertation

12.1 At the end of the student's research work the student shall submit a Thesis/Dissertation which must be an original contribution to Engineering/Science and worthy of publication. At least 6 (six) printed copies of the Thesis/Dissertation in the prescribed format must be submitted to the Head of the Department.

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

12.3 On the completion of the research work and submission of the Thesis/Dissertation an oral examination shall be arranged on a date(s) fixed by the Supervisor in consultation with the Head of the Department in which the student shall defend their research work. The student must satisfy the examiners (as constituted in Article no. 13.1) that s/he is capable of intelligently applying the results of his/her research work to the solution of problems, of undertaking independent research and afford evidence of satisfactory knowledge related to the theory and technique used in their research work.

12.4 In order to qualify for the Degree, a student must have 2 (two) numbers of publications (of which at least one should be published in a journal) relevant to their research work.

13. Examination Board

13.1 An Examination Board for each student for Thesis/Dissertation and oral examination shall consist of the Doctoral Committee and one or more external examiner(s) to be approved by the Academic Council through the CASR on the recommendation of the Thesis/Dissertation Supervisor in consultation with the Head of the Department. The Board shall consist of at least 6 (six) and maximum 8 (eight) members including the Head of the Department and the Supervisor. The Supervisor shall act as the Chairman of the Examination Board. At least one external examiner shall be appointed from outside the University (DUET). If the external examiner is appointed from outside the country a copy of the Thesis/Dissertation should be sent to them for their evaluation and their written opinion be placed before the Examination Board.

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

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

14. Cancellation of Admission

The admission of a student shall be cancelled by the University on the following grounds:

(i) Non-payment of dues of the University and the Halls of residence within a prescribed period.
(ii) If the requirements in Article no. 11.2 and 11.3 are not fulfilled by the student.
(iii) Forced to discontinue their studies by the Board of Discipline.

(iv) Withdrawn officially from the Ph. D program.

15. Academic Fees

Academic fees will be reviewed by the appropriate authority of the University from time to time.

16. Extension of Time for Completion of Degree

The application for extension of time span of a student should be approved by the Academic Council through CASR on the recommendation of the Doctoral Committee. A prescribed form may be used for this purpose. The application must be submitted before the normal time span has elapsed.

Rules and Regulations Relating to Discipline

General Discipline

1. There shall be a Board of Discipline (ছাত্র শৃঙ্খলা কমিটি) to supervise and control the discipline of the students of the University.

2. The Board shall consist of the following members:

i.	Vice-Chancellor	Chairman
ii.	Two Deans (To be nominated by the Academic Council)	Member
iii.	Three Heads (Two from Engineering and One from Non Engineering Departments) (To be nominated by the Academic Council)	Member
iv.	Two Provosts of Halls of Residence (To be nominated by the Academic Council)	Member
v.	Director (Students' Welfare).	Member Secretary

3. At least 50% of the total members of the board shall form a quorum. The term of office of the nominated member shall be two years.

4. All incidents which appear to be acts of indiscipline and misconduct committed by any student, including immediate action taken, if any, shall be reported to the Vice-Chancellor by the respective Provost in respect of indiscipline and misconduct in the Halls of Residence and their premises, and by the Head of the Department in respect of indiscipline and misconduct in the class rooms, laboratories, work-shops, all parts of the academic premises and any other place in the campus, and by the Invigilator through the Chief Invigilator in respect of indiscipline and misconduct in the Examination Halls, and by the person concerned (through respective Head/Section Chief) from the students and employees of the University in respect of misconduct committed outside the University campus.

5. A student, who neglects his studies, disobeys and/or denounces orders, rules and regulations, ordinances, statutes of the University, shows misbehavior towards the employees of the University or commits any other offence which will be deemed by the Vice-Chancellor or Director of Students' Welfare or teachers of the University as misconduct and breach of discipline, will be liable to disciplinary action which may range from warning, imposition of fines, suspension to expulsion for good from the University depending on the magnitude of the offence as will be deemed fit by the authorities competent to take disciplinary action as defined in Section 6.

6. Authorities to take disciplinary action with their respective powers to the extent to which they can impose punishment on any student or group of students are:

Authorities for taking Disciplinary Action	***Power**	**Appellate Authority**
Board of Discipline	(i) Warning (ii) Imposing fine (iii) Suspension from Halls/ University for any length of time and (iv) Expulsion from Halls/ University for good	Academic Council
Vice-Chancellor	(i) Warning (ii) Imposing fine and (iii) Suspension up to 2 (two) years from Hall/ University (iv) Expulsion from the Hall for good	Board of Discipline
Head of the Department (On students of his Department)	Warning and Imposing fine up to Tk. 1000/-	Vice-Chancellor

Authorities for taking Disciplinary Action	***Power**	**Appellate Authority**
Director of Students' Welfare	(i) Warning (ii) Imposing fine up to Tk. 1000/- (iii) Suspension from the Halls up to 2 (two) years and (iv) Expulsion from the Hall for good.	Vice-Chancellor
Provosts (on resident or attached students of his Hall of residence)	(i) Warning (ii) Imposing fine up to Tk. 500/- and (iii) Suspension from the Hall for a period of up to 2 (two) years.	Director of Students' Welfare

*Respective authority may impose one or more punishment(s) at a time. Any of the above authority will inform the Director of Students' Welfare for any type of punishment imposed on any student for record.

7. If the Vice-Chancellor feels that the action taken against a student or a group of students (by any of the above authorities other than Board of Discipline) on an offence brought to him is not appropriate or that no action has been taken on any offence observed by him, he will take appropriate disciplinary action against a student or a group of students.

   If however, in any case of breach of discipline the Vice-Chancellor is of the opinion that a punishment more than a suspension of two years is required he shall refer the matter to the Board of Discipline for a decision.

8. A student or a group of students against whom an action has been taken by appropriate authority mentioned in column (1) of Section 6 may prefer an appeal to the appropriate appellate authority mentioned in column (3) of Section 6.

9. The Director of Students' Welfare will be responsible for enforcement of the disciplinary action taken against a student or a group of students. He shall maintain a register and shall record therein all actions taken against a student for indiscipline and misconduct and also shall record in all Character Certificates/Testimonials issued by the Director of Students' Welfare to offenders, those actions taken against them if so indicated by the Vice-Chancellor and the Board of Discipline, unless allowed to be expunged/condoned by the Vice-Chancellor on written prayer from the offenders.

10. Character Certificates/Testimonials issued by the Director of Students' Welfare shall be produced by the students when requested for that certificate.

Discipline of Examinations

11. The Chief invigilator shall be responsible for maintenance of discipline in the examination Halls.

12. An Invigilator on duty in Examination Hall shall report to the Chief Invigilator in case of breach of discipline in the examination hall. The Chief invigilator may expel the examinee concerned from the hall debarring him from appearing in that particular examination.

13. Breach of discipline in the examination halls shall be reported by the Invigilator through the Chief Invigilator to the Vice-Chancellor.

14. The candidates shall strictly follow the following instructions.

    i. Candidates are forbidden to write their names on the cover or any part of the answer script. If any candidate does so, his answer script will not be assessed.

    ii. Each candidate must write legibly his Examination Student Number on the cover of scripts. If any candidate omits to write his Examination Student Number and Registration Number on the cover of his answer script, the paper may not be assessed.

iii. When more than one answer script is used, each additional script should be stitched to the first script immediately after it is supplied, and the Examination Student Number and Registration Number should also be written by the candidate on the cover of the additional script or scripts immediately.

iv. No loose paper will be provided for scribbling, and no paper is to be brought in for this purpose. Any candidate found with loose paper in his possession will be expelled from the examination hall. All works must be done in the scripts provided and pages must not be torn out. The scripts provided must be submitted; it cannot be replaced by another, but, if necessary, additional scripts will be given. All works intended for assessment by the examiner should be written on both sides of the paper.

v. Candidates are forbidden to write anything whatsoever on the question paper. In any matter not specifically mentioned in these rules, candidates are required to abide by decision of the invigilator in the examination room.

vi. No candidate will be allowed to leave examination room until one hour has elapsed from the time when the question papers are given out.

vii. Candidates are forbidden to carry Mobile Phone with them in the examination room.

15. Disciplinary action will be taken against candidates reported to have violated the instructions under Section 14 or resorted to unfairmeans and/or acts of indiscipline at the different examinations as follows:

i. Attempts to communicate with other examinee or examinees in the examination hall: first time warning which may be accompanied by a change of seats; second time-deduction of 5% of the total marks of paper; third time-expulsion from examination hall for that paper.

ii. Possession of related to the particular subject of examination or copying from any other source: expulsion from examination hall and cancellation of the examination and expulsion from the University for one to two years. Writings in the person of examinee or in his apparels, in papers, drawing instruments, typing in mobile phones and scales etc. found with him or near the desk, bench or chair will be considered as writings in possession of examinee.

iii. Possession of mobile phones, media players etc: Deduction of 5% of the total marks of the paper.

iv. Use of violent language and holding out threats to examiners and invigilators: expulsion from the whole examination and/or expulsion from the University for good.

v. Attempts to get possession of the question paper or examination scripts before the examination: expulsion from the whole examination and expulsion from the University for one to two years.

vi. Writings on loose papers not related to the examination (viz. blotting paper, question paper etc.); seizure of the writings and cancellation of the answer script and expulsion from the examination hall.

vii. Attempts to influence the examiner: cancellation of the paper.

viii. Impersonating or causing to impersonate in the examination hall: cancellation of the whole examination and expulsion from the University for good.

ix. Insertion in the examination script, answer to any question or questions written outside the examination hall: cancellation of the whole examination and expulsion for one to two years.

x. Having a question answered by someone else: cancellation of the whole examination and expulsion for two years.

xi. If a student or outsider appears at the examination for any student: cancellation of the whole examination for both students, expulsion for two years for the student who appears at the examination for any student and one year for other student.

16. The invigilator is empowered to warn a student and deduct his mark up to 5% as mentioned in section l5 (i) above. The Chief Invigilator is empowered to expel students from the examination room/hall if he is satisfied after an on the spot enquiry that the student is guilty of misconduct mentioned in section 15, above. In all such cases the matter has to be reported to the Vice-Chancellor with incriminating documents, if any. Decisions for cancellation of the examination and expulsion from the University for a period of not exceeding 2 (two) years will be taken by the Vice-Chancellor. For expulsion for a period more than 2 (two) years, the Vice-Chancellor shall refer the matter to the Board of Discipline provided in Section 6.

17. As the Class Test/Quiz is the part of whole examination, therefore, disciplinary action for any misconduct in this examination will also be applicable as mentioned in section 11 through 16.

Courses and Syllabus for Postgraduate Programs

List of Courses

Dissertation

Ch 6000: Thesis
(Credit: 18 hrs. for M Sc., 30 hrs. for M Phil. and 45 hrs. for Ph. D)

Theory Courses

Course No.	Course Title	Credit
Ch 6101	Advanced Chemical Kinetics	3
Ch 6102	Advanced Chemical Thermodynamics	3
Ch 6103	Surface Chemistry	3
Ch 6104	Biophysical Chemistry	3
Ch 6105	Advanced Polymer Chemistry	3
Ch 6106	Analytical Chemistry	3
Ch 6107	Organometallic Chemistry	3
Ch 6108	Environmental Chemistry	3
Ch 6109	Bioinorganic Chemistry	3
Ch 6110	Chemistry of Materials	3
Ch 6111	Nuclear and Radiochemistry	3
Ch 6201	Pharmaceutical Chemistry	3
Ch 6202	Food Chemistry and Technology	3
Ch 6203	Chemistry of Natural Products	3
Ch 6204	Chemistry of Biomolecules	3
Ch 6205	Chemistry of Carbohydrates	3
Ch 6206	Spectroscopic Methods in Chemistry	3
Ch 6207	Medicinal Chemistry	3
Ch 6208	Organic Synthesis	3
Ch 6209	Advanced Organic Reaction Mechanism	3
Ch 6210	Advanced Stereochemistry	3
Ch 6211	Organic Pollutants in the Environment	3
Ch 6212	Synthetic Organic Polymer	3
Ch 6213	Chromatographic Techniques	3
Ch 6214	Textile Chemistry and Technology	3
Ch 6215	Nanochemistry and Technology	3
Ch 6216	Enzymes, Hormones and Vitamins	3

Detailed Syllabus

Dissertation

Ch 6000 Thesis
(Credit: 18 hrs. for M Sc., 30 hrs. for M Phil. and 45 hrs. for Ph. D)

Theory Courses

Ch 6101 Advanced Chemical Kinetics 3 Credits
Theories of Reaction Rate: Kinetic theory of collision, Generalized kinetic theory, Conventional transition state theory.

Elementary Gas-Phase Reaction: Unimolecular reactions: Lindemann-Christian Hypothesis, Hinshelwood's treatment, Rice-Ransperger- Kassel (RRK) treatment, Marcus's extension of the RRK treatment(RRKM)

Elementary Reaction in Solution: Solvent effect on reaction rates, Factors determining the reaction rates in solution, Transition state theory, Influence of internal pressure and influence of solvation, Reaction between two ions: influence of solvent dielectric constant, Pre-exponential factors, Single-sphere activated complex, Influence of ionic strength.

Homogeneous and Heterogeneous Catalysis: General catalytical mechanism, Steady state treatment, Activation energies for catalyzed reaction, Acid-base catalytic reaction, Mechanism of acid-base catalyzed reaction, Catalytic activity and acid-base strength, Enzyme catalyzed reactions.

Ch 6102 Advanced Chemical Thermodynamics 3 Credits
Thermodynamic Parameter: Entropy, Enthalpy and free energy: Definition, Significance, Application and Estimation, Thermodynamic quanties of biological processes.

Thermodynamics and Statistical Mechanics: Molecular basis of entropy, Entropy and probability, Connection between thermodynamics and statistical mechanics.

Partition Function and Equilibrium: Relative free energy functions distinguishing ability, Third law and Sachur-Tetrod entropy. Statistical weight and entropy, Quantum statistics: Fermi-Dirac rule, Fermi-Dirac distribution law and Bose-Einstein statistics.

Thermodynamics of Solution: Thermodynamics of solution and partial molar quantities, Thermodynamics of mixing.

Ch 6103 Surface Chemistry 3 Credits

Surface Tension: Surface tension, Surface free energy, Surface active agents: Definition, Classification, behavior in solution, methods for measurement of surface tension, Contact angle, Drops, Bubbles and meniscus.

Adsorption Theories: Concept of monolayer, Formation, Application of monolayer, Adsorption from solution and its application, Adsorption isotherm, Simple Langmuir adsorption isotherm,

Physical Adsorption at Gas-Solid Interfaces: Non-ideal adsorption, Structure of solid surface and adsorption layer, Multilayer adsorption, The BET equation, Adsorption heat, Capillary adsorption,

Reaction on Surface: Mechanism of surface reaction, Kinetic effect of surface homogeneity, Unimolecular surface reaction, Bimolecular surface reaction between a gas molecule and adsorbed molecule.

Colloidal Nature of Surfactants Solution: Micelle formation, Ionization, Structure and Shape of micelle, Thermodynamics of micellization, Critical micelle Concentration (CMC), Methods of measurement of CMC, Effect of structural modification, Temperature, Salt, pH and Solvent on CMC.

Surface Characterization: Principle of Low Energy Electron diffraction (LEED), Scanning Electron Microscopy (SEM), Auger Electron Microscopy (AEM) and their application in solid surface characterization.

Ch 6104 Biophysical Chemistry 3 Credits

Biological Membranes: Structure and functions, Chemical potential, Phase transitions, Thermochemistry, Exact differentials in Biological Membranes, Membrane transport, Donnan effect, Donnan equilibrium, Dialysis and equilibrium dialysis.

Binding Small Organic Molecules to Macromolecules: Metal complexation in biological systems, Equilibrium constants and thermodynamic treatment, Sctchard plot, Cooperative binding, Hell plot.

Enzyme Kinetics: Enzyme catalysis, Reaction rates, Michaelis Menten kinetics, Steady state kinetics, Enzyme inhibition, Mixed inhibition, pH control of enzyme catalysis reactions cell inhibition by substrate, Activation of metal ions, Hydrophobic interaction, Protein stability and denaturation, Allosteric interactions.

Ch 6105 Advanced Polymer Chemistry 3 Credits

Polymers: General survey of polymers, Method of study of polymers.

Behavior of Polymers in Solution: Thermodynamics of polymer solution, Flory-Huggins treatment, Crystalline melting point and glass transition temperatures of polymers, Effect of chemical composition upon crystalline melting point and glass transition temperatures of polymers, Viscosities of polymer solution.

Rheology and Mechanical Properties of Polymers: Kinetic theory of rubber elasticity, Viscoelastic behaviour of amorphous polymers (incompressible viscoelelastic material, time effects, time-temp. equivalence principle, effects of molecular architecture on viscoelastic properties, effect of chemical composition on viscoelastic properties).

Study of Some Typical Inorganic Polymers: Structure and properties of some polymers (i) Borazines (ii) Phosphonitrile polymer (iii) Silicone polymer (iv) Sulphur nitrogen polymer (v) Fluorocarbons

Biodegradable Polymer: Definition, classification, application, different types of biodegradable polymer (chitin, chitosan, gelatin, alginate) etc.
Conductive Polymer: Definition, Properties and Applications.

Polymer Processing: Plastic, Fibre and Elastomer technologies.

Identification and Characterization of Polymers: Preliminary tests, Visual cutting, Heating and fusion test, Solubility tests, Spectra (UV, IR, NMR) of known polymers and thermal analysis of polymer (TGA, DTA, TMA).

Measurement of Molecular Weight and Size: End group analysis, Colligative property measurement, Light scattering, Ultracentrifugation, Solution viscosity and molecular size, Polyelectrolytes.

Analysis and Testing of Polymers: Chemical analysis of polymer, Spectroscopic method, X-ray diffraction analysis, Microscopic analysis, SEM.

Ch 6106 Analytical Chemistry 3 Credits

Statistical Treatment of Data: Population and sample mean standard deviation, Relative standard deviation, Coefficient of variation, Variance, Confidence limit, Statistical test, Coefficient of correlation, Regration lines, Least square method.

Complexometric Method of Analysis: Complexation of metal ions, Complexation equilibria, Influence of $[H^+]$ ion on complexation, Metal chelate stability, Masking and demasking, Uses of EDTA titrations.

Solvent Extraction: Separation processes, Liquid-liquid extraction, Distribution of solid between solvent pair, Batch and continuous extractions. Solvent extraction and separation of elements by co-precipitation.

Spectrometric Methods of Analysis: Theory and applications of X-ray spectroscopy, X-ray fluorescence, Atomic absorption and emission spectroscopy, Flame emission spectrometry.

Atomic Absorption Spectrophotometry: Principle, instrumentation and interferences, Electrothermal analyzer, Sample requirements and general preparation techniques, Advantages and disadvantages of AAS.

Chromatographic Techniques of Analysis: General principle and classification of chromatography, Principles and applications of paper chromatography, Thin Layer Chromatography (TLC), Liquid Chromatography (LC), Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Ion Exchange Chromatography (IEC), LC-MS, GC-MS.

Polarographic and Voltammetric Techniques: Current voltage relationship, Direct Current (DC) polarography, Alternating current and pulse polarography, Stripping voltammetry.

Ch 6107 Organometallic Chemistry 3 Credits

General Feature: Classification of organometallic compounds, Compounds with metal-carbon σ-bond, Compounds with metal-carbon π-bond, Compounds with multiple metal-carbon bonds the 18-electron and 16-electron rule π-donor complex, back donation.

Preparation, Structures and Bondings of Organometallic Compounds with Metal-Carbon σ-Bond: Metal alkyls and aryls, Grignard reagent, Alkyl aluminiums. Preparation, Structures and Bonding of Organometallic Compounds with Metal-Carbon π -Bond: 2-electron donor e.g. Zeise's salt and other monoolefin complexes, 3-electron donor e.g. π-allyl and π-enyl complexes, 4-electron donor e.g. Conjugated diolefin and cyclobutadiene complexes, 5-electron donor e.g. Cyclopentadienyl complexes, 6-electron donor e.g. Arene complex, Isolobal analogy and agostic interactions.

Properties of Metallocenes: Aromaticity, Basicity, Magnetic susceptibility, IR spectra, Electronic spectra, NMR spectra

Organometallic Reaction and Mechanism: Substitution reaction, Insertion reaction, CO, SO_2 and olefin insertions, Oxidative addition and reductive eliminations, Ring expansion, Ligand and metal exchange reactions.

Catalytic Application of Organometallic Compounds: Hydrogenation of Olefin, Hydroformylation, Olefine metathesis, Wacker process, Dimerization of alkene, Polymerization of alkenes and alkynes, 18-electron and 16-electron rule in homogeneous catalysis.

Metal Cluster: Osmium, Ruthenium and Iron cluster and their structure, Synthesis, Reactivity, Boron hydride clusters.

Ch 6108 Environmental Chemistry 3 Credits

Pollution: General concept of pollution, Different types of pollution, Causes of pollution.

Air Pollution and its Effect: Natural air pollution, Anthropogenic air pollution, Gas-phase pollutants, Photochemical smog formation, Thermal air pollution, Greenhouse effects, Acid rain, Ozone depletion in stratosphere, Short and long range transport, Transformations of air pollutants, Impacts of air pollution on human health.

Water Pollution: Types and Nature of water pollution, BOD, COD, Elemental pollutants, Arsenic pollution, Heavy metals, Inorganic species, Organic pollutants, pesticides in water, Polychlorinated biphenyls (PCBs), Polyaromatic Hydrocarbon (PAH), Oxidants and reductants in water, Agrochemicals: Fertilizers and pesticides, Behavior of pesticides in soil, Mode of action, Environment friendly fertilizers, Radionuclides in water, Industrial wastes and chemical treatment of industrial wastes, Water and waste water treatment.

Waste Materials and Their Appropriate Disposal by Proper Chemical & Biological Treatment: Municipal waste, Domestic & hospital/medical wastes. Treatment of municipal sludge by radiation technique.

Toxicological Chemistry in the Environment: Principle of environmental toxicology, Toxicants in the environment, Impacts of toxic chemical on enzymes, Biological effects of As, Cd, Pb, Hg, CO, NO_x, SO_x, O_3 and cyanides, Pesticides, Environmental fate of toxicants, Health risk assessment of toxicants. Hazardous Chemicals.

Policy for Protection of Environment: International and national regulation for protection of the environment, Environmental quality standard, EU, EPA, and WHO guideline for the protection of environment

Ch 6109 Bioinorganic Chemistry 3 Credits

Inorganic Elements in Biological System: Elements in biological systems, Biological function of inorganic elements; Na, K, Mg, and Ca. Na-K pumps, Cyclic enzyme reaction in sodium pumping, ATP and eversion mechnism, Selectivity of Na-K in eversion.

Atom and Group Transfer Chemistry: Formation and structure of hemoglobin and myoglobin, Oxygen-atom-transfer reactions, Magnetic and structural properties of transient Fe-O_2 system in hemoglobin, The pi-acceptor ligands CO, CN-, N_3- RCN, and SCN- competing with O_2 for the Fe atom, the O_2 saturation curves, Models of O_2 binding and concept of artificial blood.

Binding of Metal Ions Complexes to Bio-molecules: Selection and insertion of metal ions for protein sites-thermodynamic control, Kinetic control, Bioavailability, Metal-ion and metal complex binding to nucleic acids.

Electron-Transfer Proteins: Electron carriers, Iron-sulfur protein, Cytochromes, Long distance electron transfer,

Metalloenzymes: Classification of metalloenzymes in the humans, Structure- function relationship of the metalloenzymes, The mechanism of zinc carboxypeptidase and zinc carbonic anhydrase in protein hydrases and CO_2 conversion to HCO_3- in the human, Redox catalysis, The medeator enzymes, Cytochrome P-450 enzymes and its mechanism.

Other Metal Binding Biomolecule: Vitamin and coenzyme B_{12}, Prosthetic group.

Ch 6110 Chemistry of Materials 3 Credits

Materials: Classification of materials, Modern and Future Materials.

Solid Materials: Reaction types, Quality criteria and assessments, Sol-gel technique, Thin film preparation, Chemical transport, Thermodynamic of solid state reactions, Liquid crystals, Classification of liquid crystals and their possible phase transitions.

Properties of Solid Materials: Phase transitions, Classifications of phase transitions, Stable and metastable phases, Representation of phase transition on phase diagram, Electrical conductivity of inorganic solid, Dielectric materials, Ferroelectricity, Pyroelectricity, and Piezoelectricity, Relation of structure and magnetic property of transition metal oxides, Perovskites, Spinel, and illmenites.

Glass and Ceramic Materials: Different types of Glass and Ceramic Materials, Fabrication and processing of glass, Ceramic phase diagram, Imperfection in ceramics, Properties of glass and ceramic.

Superconductors: Superconductivity, Theories of superconductivity, Applications, Recent development of superconducting materials.

Nanomaterials: Bulk Behavior, Synthesis, Chemical Application and Kinetics of Chemical Reactions in nanosystems. Advanced Materials: Fullerenes and Carbon Nanotube, Optical Fibers in Communications, Polymer Electrolytes.

Ch 6111 Nuclear and Radiochemistry 3 Credits

Nuclear Structure and Properties: Nuclear stability and binding energy, Nuclear spin and moment, Nuclear potential, Models and properties of nuclear structure, Comparison of various models, Nuclear parity and nuclear symmetry.

Nuclear Reaction and Energy: Basic principles of chain reacting system, Reactors and their uses, Reactor associated problems, Controlled thermonuclear reactions, Extraction of Uranium and Thorium from ores, Separation of Uranium and Thorium, Generation of electricity from nuclear power plant, Thermal and fast neutron reactors, Fusion reactor technology.

Nuclear Spectroscopy: α-, β-, γ- decay schemes, α-, β-, γ- spectrometry, α-spectroscopy with silicon barrier detector, High resolution α-spectroscopy with Ge detectors, Detection of neutrons with BF_3 detectors, Mossbaur spectroscopy and its application.

Transuranium Elements: General ideas about transuranium element, Z-93-106, and their nuclear properties, Production, Separation and purification, Their chemistry and uses, Synthesis of superheavy elements.

Hot Atom Chemistry: Formation of recoil atoms, Mechanism of reactions of recoil atoms, Hot atom reaction in solid, reaction of recoil tritium and carbon atom.

Nuclear Technology: Radiation induced chemical polymerization, Diagnostic and therapeutic uses of radioisotopes, Positron imaging, Radiolysis of water, Food preservation.

Nuclear Safety Issues: Nature of environmental radiochemistry, Biomolecular effects of different types of radiation, Radiation sensitivity of organs and organisms, Somatic effects of large doses on human being, Disposal of radioactive wastes.

Ch 6201 Pharmaceutical Chemistry 3 Credits

Raw Materials Processing: Pharmaceutical process, Raw material, Classification, Testing, Importance of pharmaceutical chemicals and processing of pharmaceutical products.

Drugs: Definition, Classification, source, Routes of administration, Mechanism of drug action, (i) Tablets: Definition, Classification, Making and coating, (ii) Capsules: Definition, Classification, Filling, Importance

Synthesis and Quality Control: Synthesis, Application and mode of action of different drugs, Quality control of pharmaceutical products.

Ch 6202 Food Chemistry and Technology 3 Credits

Basic concepts: General aspects of food industry, World food needs and Bangladesh situation, Constituents of food, quality and nutritive aspects, Food additives (Vitamins, Amino acids, Minerals, Flavor enhancer, Food colors; Antioxidants, Acids, Bases, Thickening agents, Gel builders, Stabilizers), standards, deteriorative factors and their control.

Food Preservation: Preservation by heat and cold, dehydration, concentration, drying, irradiation, micro wave heating, sterilization and pasteurization, fermentation and pickling and by various packing methods.

Production and Utilization of Food Products: Cereal grains, Pulses, Vegetables, Spices, Fats and oils, Bakery, Confectionery and Chocolate products.

Food Processing: Soft and alcoholic beverages, Milk and dairy products (i) Milk: Physical and Physico-chemical properties, Composition, Processing of milk, Types of Milk. (ii) Dairy Products: Production of fermented milk, e.g. Sour milk, Yoghurt, Cream, Butter, Condensed milk, Dehydrated milk products, Ice cream, Cheese.

Fruits and Fruit Products: (i) Fruits: Composition, N-containing compounds, Carbohydrales, Lipids, Organic acids, Phenolic compounds, Hydroxyaromatic acids, Flavonoid compounds, Anthocyanidins, Aroma compounds in different fruits, Vitamins & Minerals in fruits, Chemical changes during ripening of fruits.

(ii) Fruit Products: Production and Preservation-Dried fruits, Canned fruits, Deep frozen fruits, Fruits in Sugar Syrups, Fruit juices; Fruit Nectars, Fruit juice concentrates, Fruit syrups, Fruit powders; Fruit juice beverages, Lemonades; Caffeine containing beverages, Analysis. Tea, Cocoa and Chocolate: Harvesting and Processing, Composition, Preservation.

Food Contaminants: Toxic trace elements; Toxic compounds of microbial origin; Pesticides, Veterinary medicines and feed additives; Polychlorinated Biphenyls (PCB's), Polycyclic aromatic hydrocarbons, Nitrosamines, Cleansing agents and Disinfectants.

Food Analysis: Moisture, ash, crude protein, fat, crude fiber, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration; common adulterants in food, contamination of food stuffs, microscopic examination of foods for adulterants. Pesticide analysis in food products. Extraction and purification of sample; HPLC, gas chromatography for organophosphates; thin-layer chromatography for identification of chlorinated pesticides in food products.

Ch 6203 Chemistry of Natural Products 3 Credits

Terpenes of Different Groups: Sources, Structures, Reactions; Biosynthesis of terpenoids Study of some important alkaloids: Myrcene, Ocimene, Citral, Menthol and Menthone, Ionones, α-Pinenes.

Steroids and Hormones: Spectral properties, Configurations, Reactions of steroid, Sterols, Chemistry of Cholesterol, Stigmasterol and Saponins, Biosynthesis of sterols; Bile acids. Hormones, Sex Hormones, Oestrogens, Gestogens, Testosterone, Non-Steroid Hormones.

Anthocyanins: Chemistry of anthocyanins, Flavonoids and carotenoids, Biosynthesis of carotenoids and flavones; Haemoglobin, Chlorophyll.

Alkaloids: Extraction, Isolation and purification; Study of some important alkaloids: Ephedrine, Adrenaline, Nicotine, Atropine, Quinine, Papaverine, Biosynthesis of Alkaloids.

Ch 6204 Chemistry of Biomolecules 3 Credits

Proteins and Amino Acids: Structures, Properties, Classification, Biosynthesis of Proteins, Peptide linkage, Role of Protein in biological systems. Synthesis of Peptide, Amino Acid, Analysis of Amino acid from protein hydrolysates, Biosynthesis of Amino Acid, Lipids and phospholipids.

Nucleic Acids and Nucleoproteins: Role in biological systems of DNA and RNA, Structures, Synthesis of DNA and RNA, and Functions of DNA and RNA.

Enzymes: Enzymes, General nature of Enzyme, Nomenclature and Classification of Enzymes, Co-Factors, Specificity of Enzyme action, Mechanism of Enzyme action, Enzyme inhibition, Reactions Catalyzed by Enzyme and Co-enzyme, Role of Enzymes in drug Design,

Vitamins: Physiological action and sources of Vitamin A, D, K and thiamine, Riboflavin, Niacin, Pantothenic acid, Cyanocobalamine, Folic acid and Ascorbic acid.

Ch 6205 Chemistry of Carbohydrates 3 Credits

Mono-and Disaccharides: Structures, Configuration assignments and conformational analysis of mono and disaccharides, Hudson's rule, Lactone rule, Reactions of sugars including their actions with acids and bases. Esters, ethers and acetals of sugars. Anhydro-sugar, Branched chain sugar, Unsaturated sugar, Deoxy-sugar and polyamine sugar.

Oligosaccharides: Rafinose, Gentionose, Melezitose,

Polysaccharides: Structural investigation, Group analysis, Barry and Smith degradation, Determination of molecular weight, Amylose, Amylopectin, Cellulose, Hemicellulose, Glycogen and inulin. Sulphated polysaccharides.

Cellulose and Starch: Classifications, Structure and Properties of Cellulose and Starch, Sea weeds and Algae.

Recent Advances in Carbohydrate Chitosan, Gelatin, Heparin, Carrageenan, Alginate, Nanocellulose and others.

Ch 6206 Spectroscopic Methods in Chemistry 3 Credits

UV Spectroscopy: Principle of measurement, Electron excitation, Chromophores, Rules of calculations of λ_{max}, Study of simple and complex molecules, Applications in studying different complexations.

IR Spectroscopy: Vibration spectra, Factors affecting IR frequencies, FTIR and Raman spectroscopy, Applications in different systems.

NMR Spectroscopy: General concept, Nuclear Overhauser Effect (NOE), Interpretation of spectral data (ID), theory, Experimental method, Spin-Spin coupling (AB, ABX, ABX_2 system), Factors affecting coupling constants, Relaxation effect, Spin lattice relaxation, Spin-Spin relaxation and ^{13}C-NMR Spectroscopy, 2D-NMR COSY, NOESY, DEPT, INEPT, HMBC,

HETCOR experiments, Application of NMR in structure elucidation of organic compounds.

Mass Spectroscopy: Theory, Ionization techniques, Fragmentation and elucidation of structures of organic compounds, Tandem mass Spectroscopy (MS-MS/MS-MS-MS), Analyzer, Magnetic sector, Quadrapole, Ion Trap, Time-Of-Flight (TOF), Fourier Transform Ion Cyclotron Resonance (FTICR), Joint application of UV, IR, NMR and Mass spectroscopy in the structure elucidation of organic compounds-illustration with the spectra of typical compounds, ESR.

Ch 6207 Medicinal Chemistry 3 Credits

Physiochemical Properties and Biological Activity of Drug: Drug-Receptor Interactions, Hydrogen bonding and its effect, Drug absorption and Biological membrane, Factors affecting the accessibility of the drugs to the active site.

Drug Metabolism: Pathways of Metabolism. Drug biotransformation pathways (phase 1) Drug conjugation pathways (phase-2), Glucosonic Acid conjugation, Sulfate conjugation.

Anticancer Agents: Definition and cause of cancer, Genetic faults leading to cancer, Treatment of cancer, Drugs action on nucleic acid, Drugs acting on enzymes, Hormone based therapies, Miscellaneous anticancer agents, Antibodies, Antibody conjugates and gene therapy, Antifungal, Antiviral, Antidiabate.

Antiulcer Agents: Definition and cause of peptic ulcers, Treatment of peptic ulcer, Gastric acid release, Hydrogen antagonists: Histamine and histamine receptors, Searching for a Pb. Cimetidine: Biological activity, Structure and activity, Metabolism, Ranitidine and its structure activity relationship, Traditional and herbal medicines.

Medicinal Plants: History of medicinal plants and Ethorobotany, Principle of identifying Medicinal plants, Fundamentals of phytotherapy, Toxic Plants, Metabolic engineering of plant natural products.

Ch 6208 Organic Synthesis 3 Credits

Synthesis of Alicyclic Compounds (including fused ring System), Basketene, Cubane, Triastaran, Tetrahedran and its derivative, Cyclophanes, Synthesis of Biphenyls, Condensed rings with benzenes and heterocycles.

Selectivity: Definitions, stereotopic and stereofacial selectivity, Intramolecular Symmetry, Topicity and Prochirality.

Stereoselective Reactions of Carbonyl Compounds: Nucleophilic addition to Carbonyl compounds use of a chiral substrate, Use of a chiral reagent and catalyst, Asymmetric conjugate addition, Addition of alkylboron derivatives, Stereoselectivity of enolate formation, Alkylation of enolates, the aldol reaction, Asymmetric aldol reactions;

Stereoselective Reactions of Alkenes: The Diels-Alder reaction, chiral dienophiles, Chiral dienes, Chiral Lewis acids, Sigmatropic rearrangement Stereoselective hydroboration substrtes control, Reagent control, Catalyst control, Stereoselective hydrogenation, Stereoselective epoxidation, Asymmetric dihydroxylation.

Stereospecific Synthesis: Retrosynthetic approach.

Synthesis of Dyes and Pigments: Definitions, Requisites of a true dye, Era of natural dyes, Nomenclature of dyes Intermediates, Nomenclature of dyes, Types of fibres, Dyeing, Fastness properties, Classification of dyes, Azo dyes, Textile dyes, Synthesis of the following dyes; Eriochrome Black T, Eriochrome Black A, Eriochrome Red B, Diamond Black F, Direct Deep Black, Safranine T, Alizarin cyanin Jreen G, Rhodamine B. Pigments, Synthesis of important pigments,

Ch 6209 Advanced Organic Reaction Mechanism 3 Credits

Molecular Orbitals and Frontier Orbitals: Huckel molecular orbital (HMO) method. Evaluation of aromaticity and the 4n+2 rule in terms of HMO method, Calculation of resonance energy by using α (coloumb integral) and β (resonance integral), Frontier orbital theory: HOMO and LUMO; Perturbation theory of reactivity: the α-effect; interpretation of ionic percyclic and radical reactions (substitution and addition reactions) in terms of frontier orbital theory. Electrocyclic, Sigmatropic, Cycloaddition, Concerted Reaction mechanism.

Quantitative Correlation of Acidity and Basicity: Deriviation of Hammett Ho function, Grunwald-Winstein acidity scale, Polar effects in aliphatic compounds-Traft treatment.

Kinetics and Energetics in Reaction Mechanism: Consecutive reactions, the steady state approximation; Parallel reactions; Variation in kinetics in acid and base catalysed reactions; Ambiguities in interpreting kinetic data; Microscopic reversibility; Correlation of reaction rates and equilibria.

Substitution Reactions: Comprehensive treatment of solvolytic reactions; Attempted correlation of substitution rates-the Swain and Grunwald equations; The Hammett equation and correlations with meta-and para-substituted benzene derivatives.

Addition Reaction: Multicentre addition reactions; Carbonyl addition-Cram's rule (stereochemical treatment) nucleophilic addition to related unsaturated system.

Molecular Rearrangements: Carbonium ion rearrangements in bridged bicyclic systems particularly norbornyl system treating both classical and non-classical carbonium ions showing how anchimeric assistance plays its role, Rearrangements in small ring compounds, Mechanism of free radical reactions.

Spiro Compounds and Cyclophane: Definition, Structure and properties of Spiro and Cyclophane compounds.

Ch 6210 Advanced Stereochemistry 3 Credits

Conformational Analysis: Conformation and reactivity in alicyclic, Cyclic (medium and large rings), fused and bridged ring systems (heterocyclics, decalins, anthracenes, phenanthrenes, paddlanes and propellanes, Catenanes, Rotaxane, Knot, Mobius strip, Cubane, Tetrahedrane, Dodecahedrane, Adamantine and Buckminsterfullerene) Conformational effects in small, medium and large ring systems. Curtin Hammett principle, its application in determining the course of reaction.

Optical Activity Due to Atoms Other than Carbon: Nitrogen, Phosphorus, Arsenic, Sulphur, Selenium and other chiral compounds.

Prostereoisomerism, Prochirality and Pseudochirality: Terminology, Homotopic and Heterotopic ligands and faces, Heterotopicity and nuclear magnetic resonance.

Atropisomerism: Nomenclature, Synthesis and stereochemistry of biphenyls, Allenes and spiranes, Molecular propellers and gears, Helicenes, Molecules with planar chirality.

Asymmetric Synthesis: Diastereoselective synthesis, Cram's rule, Enantioselective synthesis, Double stereodifferentiation, Configuration, Diastereoisomer, Stereospecific, Stereoselective.

Molecular Recognition: Chemical and Stereochemical Aspects:
Synthetic molecular receptors (Macrocyclic polyethers, Cyclophanes, Calixarenes, Cyclodextrins), Enantioselective molecular recognition (Crown ethers with chiral framework, cyclodextrine and derivatives), Molecular recognition and catalysis, Molecular self-assembly.

Ch 6211 Organic Pollutants in the Environment 3 Credits

Degradation of Different Components of Biosphere by Environmental Pollutants: A general overview of interconnections among biosphere, atmosphere, astrosphere, hydrosphere and geosphere.

Pollution by Hydrocarbons: Chemical nature Dispersion, Evaporation, Photo oxidation & Microbial transformation to the environment, Petroleum & aquatic organisms, Biphenyl & Polychlorinated Biphenyls (PCBs), Physical and chemical properties, Environmental distribution and behavior, Polycyclic aromatic hydrocarbons (PAHs): Chemical Nature; Occurrence and behavior in the environment; Carcinogenicity and toxicity of PAHs; Persistent organic pollutants (POPs) and Volatile organic Compounds(VOCs), Effect on human and the natural environment.

Pollutants From Industries: Their Treatment by Chemical, Physical, Thermal and Photochemical Method with Special References to: Polymers & Plastic, Soap & Detergents, Chemical & Pharmaceutical and Pulp & Paper industries.

Pollutants of Recent Concerns: Ethinylestradoil, synthetic estrogens, Personal care products (PCPs): parabens, triclosan, triclocarban and synthetic musk Fluorochemicals: perfluorooctane sulphonates and their degradation products. Alkyl phenols (degradation products of surfactants). Organic Pollutants in Vegetables, Fruits and Other Food Materials: Insecticides, Fungicides, Herbicides, and their effects on environment and human health. Formulation: Wettable powder, Emulsion/solution and fumigants,

Mechanism of action and metabolism of pesticides in biological system, Detoxification and their metabolites in the environment, Insect attractant, Repellant and chemosterilant, Plant growth regulators.

The Role of Integrated Pest Management to Control Pollution: Toxicology: introduction to toxicology, Dose-response relationship, Dose & frequency of use, MRL (Maximum Recommended level) and acceptable daily intake, Integrated pest management (IPM): Definition, Key components of IPM, Pest control techniques, Reduction of pollution.

Ch 6212 Synthetic Organic Polymer 3 Credits

Addition Polymerization: Kinetics and mechanism of free-radical polymerization, Dependence of rate on the initiator and monomer concentrations, Degree of polymerization and kinetic chain length, Factors affecting chain polymerization, Inhibition and retardation, Various polymerization techniques, Ionic addition polymerization, Coordination polymerization, Ion exchange resins.

Condensation Polymerization: Type of condensation polymers, Kinetics of linear condensation polymerization, three dimensional polymers, Ring opening polymerization.

Copolymerization: Co-polymerization composition equation, Application of co-polymer composition equation, Monomer and radical reactivity, Block and graft polymers, Polymer blends, step copolymerization.

Controlled Polymerization Methods: Nitroxide Mediated Polymerization (NMP), Reversible Addition-Fragmentation Chain Transfer Polymerization (RAFT), Olefin metathesis, Grubbs Catalyst.

Stereochemistry of Polymers: Configuration and Conformation of polymers, Fischer, Saw-horse and Newman projections, Shape of polymer molecules, Tacticity.

Polymer Reactions: Hydrolysis, Aminolysis, Cyclization reactions, Hydrogenation reactions of cellulose, Cross-linking reactions, Solid phase Synthesis of peptides, Additions and substitution reaction of various groups.

Polymer Degradation and Stabilzation: Physical methods used in the study of degradation process, Type of degradation: Thermal degradation, Oxidative degradation, photodegradation, mechanical degradation, Antioxidant and stabilizers.

Synthesis and Industrial Importances of Some Versatile Polymers: Polyethylene, Polyvinylchloride (PVC), Polystyrene, Polylbutylene, Poly styrene butadiene rubber (SBR), Teflon, Saran, Orlon, Dacron, Nylon-6, nylon-6, 6, Nylon-6,10, Rayon etc.

Industrial Manufacturing Process of Some Polymers: LDPE, HDPE, PVC, Polystyrene, SBR, Teflon etc.

Identification and Characterization of Polymers: Preliminary tests, Visual cutting, Heating and fusion test, Solubility tests, Spectra (UV, IR, NMR) of known polymers and thermal analysis of polymer (TGA, DTA).

Ch 6213 Chromatographic Techniques 3 Credits

Techniques for Separation: General Principles of Chromatography, Column Chromatography, Adsorption and Partition Chromatography, PC, TLC, GC, HPLC, Ion exchange Chromatography, Flash Chromatography, Affinity Chromatography Gel Permeable, Site excluding Chromatography, Supercritical Fluid Chromatography, Gravity Elution Chromatography, Traditional Methods of separation, Purification of organic compounds, Precipitation, Sublimation, Solvent extraction, Distillation.

Chemical Methods of Separation and Purification of Organic Components: Separation of a mixture of organic components, Separation of a racemic mixture into its constituents.

Electrophoresis: Principle, Capillary and capillary zone electrophoresis, Difference between Chromatography and electrophoresis

Nuclear Analytical Techniques: Different types of nuclear analytical technique, Instrumental neutron activation analysis (INAA), Particle-induced X-ray emission (PIXE), X-ray fluorescence (XRF) and radiotracer studies, MS and NMR, Application of nuclear analytical techniques.

Ch 6214 Textile Chemistry and Technology 3 Credits

Fiber and Cotton: Concepts of textile fibers according to their nature and origin, Essential and desirable properties of textile fibers, Comparison of natural and manmade fibers. Natural Fibers: Vegetable based fibers (bast, leaf and seed fibers), Cotton: Concept of varieties, grading, distinctive properties and uses. Jute and Flax: distinctive properties and uses.

Animal Based Fibers: Wool and silk: classification, distinctive properties and uses; Man-made Fibers: Classification, Regenerated fibers: acetate, viscose & cuprammonium-General properties and uses. Synthetic fibers: Principles of polycondensation with reference to polyesters, polyamides and polyurethanes, principles of polyaddition with reference to acrylics, polyolefins, polyvinyl chlorides and co-polymers, chemical properties & uses of polyester, polyamide and poly acrylonitrile fibers.

Chemistry and Operation of Textile Dyes: Concepts and theories of colored substances, visible color, chromophores and auxochromes, qualities desirable for a dye, sources of dyes, nomenclature and classification of dyes, selection of dyes, and synthesis of some reactive and direct dyes. Exhaustion and Fixation of dyes, Kinetics of dyeing, effect of dye concentration, electrolyte, temperature, pH, machine and agitation time on dye uptake, chemistry of reactive, direct, mordant and vat dyeing. Dyeing operations with preparation of fibre and fabrics (mercerization, scouring, desizing, washing etc.

Chemistry of Finishing and Testing: Mechanical finishing of cotton, application of resins for finishing, properties imparted by finishing operation, finishing of silk, wool and linen, special finishing operations. Methods of determining wash, light and rubbing fastness, Evaluation of fastness properties with the help of grey scale.

Nanotechnology in Textile: Nanotechnology in high performance textile in textile finishing.

Medical Textile: Textile medical products, bio-medical textile products.

Textile Waste Management: Wastes in textile industries, Removal of dyes and heavy metals from waste water, Removal of toxic element used in textile finishing.

Ch 6215 Nanochemistry and Technology 3 Credits

Nanomaterials and Nanochemistry: History of Nanochemistry, Importance of Nanochemistry, Modern concepts of Nanochemistry, The sources of nanomaterials, Advances in nanomaterials.

Some Important Physicochemical Properties of Nanomaterials: Chemical properties, Physical properties and Biological properties.

Application of Nanomaterials: Chemical, Electrical, Electronics, Optical, Mechanical, Thermal, Biological and Biomedical applications.

Types of Nanomaterials: Nanofluids, Nanometal oxides and Nano-metals.

Nanomaterial Synthesis and Processing: Top down and bottom up process, Sol-gel techniques, Chemical vapor disposition (CVD), Colloidal methods, Water-Oil Microemulsions methods, Hydrothermal synthesis, Electrodeposition, Mechanical Attrition- Ball Mill processes.

Some Modern Characterization Techniques of Nanomaterials: Scanning electron microscope (SEM), Energy dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD), Transmission electron microscopy (TEM), Atomic force microscopy (AFM), X-ray photoelectron microscopy (XPS), Metallography and optical microscopy (MOM), Raman spectroscopy, Fourier transform infrared spectroscopy (FT-IR) and Ultraviolet visible (UV-Vis.) spectroscopy.

Carbon Based Nanomaterials: Graphene, Carbon nanotube (CNT), Fullerenes.

Some Selective Case Studies: Tin(IV) oxide nanoparticles, Iron oxides nanoparticles, Zinc oxide nanoparticles, Titanium(IV) oxide nanoparticles, manganese oxides nanoparticles and Silver nanoparticles. Some important polymers in nanochemistry. Environmental and health impact of nanomaterials.

Ch 6216 Enzymes, Hormones and Vitamins 3 Credits

Enzymes: Classification, comparison of enzymes with synthetic catalysts, kinetics of enzyme catalyzed reactions-Michealis-Menten equation for single substrate reaction; concept of substrate and enzyme complex. Evaluation of kinetic parameters in M-M equation. Substrate inhibition and activation. Feedback inhibition. Competitive and non-competitive inhibition. Enzyme activation and inhibition (no derivation). Study of parameters affecting enzymatic activity like pH, temperature and mechanical forces. Production and purification of enzymes. Immobilization of enzymes (physical and chemical methods). Applications of enzymes as catalysts. Industrial, medical and analytical applications of immobilized enzymes; bioenergetics; energy through EMP pathway and TCA cycle on glucose molecule. Importance of NAD and ATP.

Steroids and Hormones: Spectral properties, Configurations, Reactions of steroid, Sterols, Chemistry of Cholesterol, Stigmasterol and Saponins, Biosynthesis of sterols; Bile acids. Hormones, Sex Hormones, Oestrogens, Gestogens, Testosterone, Non-Steroid Hormones, Thyroid hormone and its function, Adrenalines- mineralocorticoids and glucocorticoids. Effects of Insulin, Thyroxin and glucocorticoids on cellular metabolism.

Vitamins: Source of different vitamins, Water and fat soluble vitamins, Vitamin deficiencies.

Address for Correspondence:
Head
Department of Chemistry
Dhaka University of Engineering & Technology, Gazipur
Gazipur-1707
Phone : +88-02- 49274014, +88-02-49274034-53, Ext. 5101 (Off.)
Fax: +88-02-49274001, +88-02-49274002
E-mail: head_chem@duet.ac.bd
Web: www.duet.ac.bd/chem