सीनेट की षष्ठम् बैठक का कार्यवृत्त

MINUTES OF THE 6th MEETING OF THE SENATE

30th April 2003

भारतीय प्रौद्योगिकी संस्थान रूड़की
रूड़की - २४७ ६६७ (भारत)

INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE
ROORKEE - 247 667 (INDIA)

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE – 247 667

No. IITR/MS/6th Senate (4/2003)/ Dated 3rd June 2003

ALL MEMBERS OF THE SENATE
Indian Institute of Technology, Roorkee

Sub.: Minutes of the 6th meeting of the Senate held on 30th April 2003 in the Auditorium of the Civil Engineering Department.

Dear Sir,

Enclosed herewith please find a copy of the Minutes of the 6th meeting of the Senate of this Institute held on 30th April 2003 at 11.00 A.M. in the Auditorium of Civil Engineering Department for your perusal. Your comments, if any, on the minutes may please be sent within 15 days.

Yours faithfully,

(A.K.Srivastava)
Lt. Col. (Retd)
Registrar

Encl: as above

Minutes of the 6th Meeting of the Senate held on 30th April 2003 at 11.00 A.M. in the Auditorium of the Department of Civil Engineering.

The following were present:

1. Prof. Prem Vrat, Director — Chairman
2. Prof. K.G.Ranga Raju, Dy. Director
3. Prof. Najamuddin
4. Prof. S.Y.Kulkarni
5. Prof. S. D. Bhattacharya
6. Prof. S.C.Gupta
7. Prof. I.M.Mishra
8. Prof. Surendra Kumar
9. Prof. Bikas Mohanty
10. Prof. A. K. Jain, Chemistry Deptt.
11. Prof. G. Bhattacharjee
12. Prof. R. N. Goyal
13. Prof. Ravi Bhushan
14. Prof. A. N. Garg
15. Prof. Kamaluddin
16. Prof. V. K. Gupta, Chemistry Deptt.
17. Prof. Anil Kumar
18. Prof. (Ms) Mala Nath
19. Prof. P.C.Jain
20. Prof. A. K. Mathur
21. Prof. Krishan Kumar
22. Prof. H.C. Mehndiratta
23. Prof. Arvind Kumar
24. Prof. N.M.Bhandari
25. Prof. P.K.Jain
26. Prof. K.K.Singh
27. Prof. V.K.Gupta, Civil Engg. Deptt.
28. Prof. R. M. Vasan
29. Prof. S.S.Jain
30. Prof. (Ms.) Indu Mehrotra
31. Prof. S.K.Thakkar
32. Prof. S.Basu
33. Prof. D.K.Paul
34. Prof. H.Sinvhal
35. Prof. A.K.Awasthi
36. Prof. H. K. Verma
37. Prof. A.K.Pant
38. Prof. R.N.Mishra
39. Prof. H. O. Gupta
40. Prof. Vinod Kumar
41. Prof. R. P. Agarwal
42. Prof. R. Mitra

43. Prof. R.C.Joshi
44. Prof. (Ms) Kum Kum Garg
45. Prof. S. N. Sinha
46. Prof. Ranvir Singh
47. Prof. Dinesh Chandra Singhal
48. Prof. Pashupati Jha
49. Prof. (Ms) Asha Kapoor
50. Prof. (Ms) Renu Rastogi
51. Prof. N.J.Rao
52. Prof. M. C. Bansal
53. Prof. A.K.Singh
54. Prof. J. S. Upadhyay
55. Prof. V.K.Nangia
56. Prof. H. G. Sharma
57. Prof. U. S. Gupta
58. Prof. G. S. Srivastava
59. Prof. S.P.Sharma
60. Prof. R. C. Mittal
61. Prof. J. S. Saini
62. Prof. S. P.Nigam
63. Prof. N.K.Mehta
64. Prof. S.C.Jain
65. Prof. S.C.Solanki
66. Prof. T.K.Bhattacharya
67. Prof. Satya Prakash
68. Prof. S.Ray
69. Prof. P.K.Ghosh
70. Prof. Ishwar Singh
71. Prof. A.K.Jain, Physics Department
72. Prof. Ravindra Nath
73. Prof. Rajesh Srivastava
74. Prof. G. S. Singh
75. Prof. Vir Singh
76. Prof. Devadutta Das
77. Prof. U.C.Chaube
78. Prof. G. C. Mishra
79. Prof. Ram Pal Singh
80. Prof. M. P. Jain
81. Prof. S. R. Bhatt, Delhi University, Delhi
82. Mr. Arun Kumar, Head, AHEC
83. Dr. (Ms) Rashmi Gaur
84. Dr. (Ms) Vijaya Agarwal
85. Lt.Col. (Retd.) A.K.Srivastava, Registrar - Secretary

The Senate recorded the apologies received from the following members for not attending the meeting:-

1. Prof. S.K.Kaushik, Department of Civil Engineering
2. Prof. (Mrs.) Renu Bhargava,, Department of Civil Engineering
3. Prof. K.L.Chopra, New Delhi
4. Prof. Surendra Prasad, IIT Delhi
5 Dr. R.P.Singh, Head, Department of Biotechnology
6. Prof. B.D.Indu, Physics Department
7. Prof. Padam Kumar, Department of Electronics and Computer Engineering
8. Prof. Gopal Chauhan, WRDTC
9. Prof. Rama Bhargava, Mathematics Department
10. Prof. A.K.Ray, DPT, Saharanpur
11. Mr. Yogendra Singh, Librarian, Central Library

Before commencement of the meeting, Prof. K.G.Rangaraju, Dy. Director, informed the Senate that Prof. Prem Vrat, Director had been conferred with the **"Outstanding Contribution Award for National Development"** by the IIT Delhi Alumni Association on 26th April 2003. He stated that this honour was not only for Prof. Prem Vrat but also for the Institute. The members of the Senate felicitated the Director on being bestowed with this honour.

The Chairman (Director) welcomed the members to the 6th meeting of the Senate. Before taking up the agenda item, the Senate thanked Dr. S.P.Srivastava, Ex-Chief Warden out going member and recorded its appreciation for his valuable contributions in the meeting of the Senate.

The Senate also welcomed a new member Dr. A.K.Singh, Chief Warden, Ravindra Bhawan and hoped for his valuable contribution and active participation in its functioning.

6.1.0 To confirm the minutes of the 5th meeting of the Senate held on 17th December 2002

The minutes of the 5th meeting of the Senate held on 17th December 2002 were confirmed.

6.2.0 To receive a report on the actions taken to implement the decisions taken by the Senate in its 5th meeting held on 17th December 2002

Noted. Further, the Senate decided that in future, a copy of the relevant BOG resolution may also be appended along with the Action Taken Report for reference of the Senators.

6.3.0 ITEMS FOR CONSIDERATION:

6.3.1 **Considered the recommendations of various Departments for reducing the number of Credits for Institute Electives to 8 from the present level of 12.**

After discussion, the Senate RESOLVED that 12 credits be retained for Institute Electives but an element of flexibility be built in. Under such flexibility, an elective will become a departmental elective for a student from the Department, which is offering the Elective, but will be an Institute Elective for a student from outside the Department. The students from B.Tech courses should also be able to take M.Sc./MCA and other PG level courses as Institute Electives with the safeguard that any course, taken by them in the previous semesters, is not identical to the course being opted for. While flexibility should be the hallmark of the system, chaos in timetable preparation should be avoided by suitably grouping the subjects.

6.3.2 **Considered the Curricular Structure of PH-101 and PH-102 (B.Tech. I Yr.) Physics Courses as proposed by the Professor & Head of Physics Department:**

RESOLVED that as considered and recommended by the Board of Undergraduate Studies in the meeting held on 27.03.2003, the Curricular Structure of PH-101 and PH-102 (B.Tech. I Yr.) Physics Courses as proposed by the Professor and Head of Physics Department be approved as under. The structure will be effective from the session 2003-2004:

Curricular Structure of PH-101 and PH-102 (Common to all B. Tech. I Yr.)

			Teaching Scheme (Hrs./Week)				Approved Structure						
							Exam Duration (Hrs.)		Relative Weightage (%)				
SUBJECT CODE	COURSE TITLE	SUBJET AREA	CREDITS	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
PH-101	Physics-I	BS	5	3	1	2	3	3	10	15	25	35	15
PH-102	Physics-II	BS	5	3	1	2	3	3	10	15	25	35	15

6.3.3 Considered revision of rates of honorarium for External Examiners for B.Tech./B.Arch. Project Viva Voce.

RESOLVED that as considered and recommended by the Board of Undergraduate Studies in the meeting held on 17th April 2003, the present rate of honorarium of Rs. 12.50 per candidate with a minimum of Rs. 300/- including setting of Question Paper be revised to Rs. 50/- per candidate with a minimum of Rs. 1,000/- including setting of Question Paper, etc. for External Examiners for B.Tech./ B.Arch. Project Viva Voce.

6.3.4 Considered the recommendations dated 27.03.2003 of the Board of Undergraduate Studies regarding provision for Summer Training for outside students:

RESOLVED THAT as recommended by the Board of Undergraduate Studies in the meeting held on 27.03.2003, the Resolution No. 2.3.15 of the Senate meeting dated 13.03.2002 regarding provision for Summer Training for outside students be revised as under:

(a) Students only from IITs, Govt. Engineering Colleges which will include a University Deptt./Institute be accepted provided the Supervisor and the concerned HOD agree to provide the training and facilities in the Department.

(b) The maximum limit per department may be 3 candidates at a time in place of 10 to 15 students in the Institute at any one time. The number of IITs students can be 3 in each department over and above.

(c) A bench fee of Rs.5000/- P.M. per student be charged by the Institute from the students/sponsoring institute(s) for the facilities made available at IITR. Other contingent expenses are to be met by the trainees themselves. However, students IITs will not be charged any bench fee.

(d) Facilities of hostel, messing and library will be provided on usual payment, if available.

(e) The sponsoring institution will not advertise in any of their publications that the practical training will be arranged at IITR.

(f) The training certificate will be given by the faculty supervisor only, after satisfactory completion of the training.

(g) The selection of trainees be decided by the concerned department. However, the decision should be referred to the DUGS.

6.3.5 Considered the recommendations of DUGC/Departmental Faculty Board of Arch. & Planning Department regarding Weightage of working drawing, seminar, rendering etc.

RESOLVED THAT as considered and recommended by the DUGC/ Departmental Faculty Board of Architecture and Planning Department and subsequently, Board of UG Studies, the overall distribution of Architecture Design (AR-201, AR-301 & AR 401) marks be approved as under:

APPROVED WEIGHTAGE %			
CWS	**PRS**	**MTE**	**ETE**
60	-	20	20

6.3.6 Considered the recommendations of BUGS to make few changes in U.G. Regulations [clause 6 (c) & (d) and Explanation of E&F Grades of Major Project]

RESOLVED that as considered and recommended by the Board of UG Studies, the changes in the under-mentioned Clauses 6 (c), 6 (d) and Explanation on 'E' and 'F' Grades of UG regulations, as typed in bold letters be approved:

6 (c) A curriculum may contain a **4**-credit course on independent study as a departmental elective, which may be offered in the fifth semester onwards. It may involve any of the following: (i) in-depth study and critical review of a specified topic, (ii) specialized laboratory work/experimental project/ feasibility studies, (iii) work on a research project and (iv) software development of a specialized nature. A student having CGPA of 7.5 or more, may register for this course only once, with the prior approval of the Chairman, DUGC during his enrolment for a bachelor's degree.

6 (d) A curriculum may contain a **4**-credit course on minor project, a departmental project, which may be offered in fifth semester onwards to carry out a design and fabrication type of project. Not more than 3 students,each having a CGPA of 7.0 or more, make carry out the

project together and register for this course only once with the prior approval of the Chairman, DUGC during their enrolment for a bachelor's degree.

Explanation on 'E' and 'F' Grades:

In case a student is awarded a failing grade in the major project, he shall have to repeat the course in the form of a new project. Such a student will have to work full time on the project for a minimum period of 3 months, and maximum 'B' grade can be awarded to the student.

6.3.7 Considered the award of S/Z grades in NCC/Proficiency and Discipline in place of existing 10 point grade system:

RESOLVED that as considered and recommended by the Board of UG Studies and in line with the recommendations of the Departments for discipline, the existing grade system based on 10 points be maintained.

The Senate FURTHER RESOLVED that in order to encourage students to work for their overall personality development, make full utilization of the excellent facilities of IITR and provide a competitive environment to demonstrate excellent performance in sports etc. and take the proficiencies/ NCC seriously as a part of their curriculum, the existing grade system be maintained.

6.3.8 Considered the provision of credits transfers from any other Institute for award of degree of IIT Roorkee.

RESOLVED that as considered and recommended by the Board of UG Studies in the meeting held on 17th April 2003 and in line with the recommendations of the Department and practices at other IITs, the provision of credits transfers from any other Institute for award of a degree of IIT Roorkee be approved as under:

(a) Transfer of credits earned by IIT Roorkee students from reputed institutions known for high academic standards in India and abroad which have an MOU with IITR concerning this aspect, be permitted.

(b) Students of IIT Roorkee who have been nominated / recommended by the Department UGC and approved by Dean, UGS for pursuing study in such other institutions, will only be eligible for such transfer of credits.

(c) The subject wise study programme for each student of IIT Roorkee and equivalence for transfer of credits based on the syllabi of the courses of the host Institutions to IITRoorkee will be recommended by the DUGC on case to case basis, and be approved by the Dean, UGS.

(d) The maximum permissible limit for transfer of credits will be 24.

(e) Grades earned in host institutions will not be considered for any award/ prize at IITR.

6.3.9 Considered the recommendations of the Departmental Faculty Board in Physics Department regarding Curricular structure of Pre-Ph.D. Courses in Physics:

Prof. A.K.Awasthi, Dean PGS&R briefed the house about the Curricular structure of Pre-Ph.D courses and highlighted the salient features. After discussion, the Senate RESOLVED that as considered and recommended by the Board of PGS&R in the meeting held on 17th April 2003, the syllabi as given at **Appendix 'A'** be approved with the following observations:

1. The process of evaluation of Pre-Ph.D courses will be as rigorous as regular courses.

2. In future, new courses be prepared on a standard format with a check list.

The Senate FURTHER RESOLVED that the under mentioned Curricular Structure of Pre-Ph.D. Courses in Physics be approved with some minor changes:

				Teaching Scheme (Hrs./Week)				Exam. Duration (Hrs.)		Relative Weightage (%)				
S. NO.	SUBJECT CODE	COURSE TITLE	SUBJECT AREA	CREDITS	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	PH-785	Advanced Classical Physics	PG-13	4	3	1	-	3	-	25	-	25	50	-
2.	PH-786	Advanced Quantum Physics	PG-13	4	3	1	-	3	-	25	-	25	50	-
3.	PH-787	Seminar	PG-17	2	-	-	-	-	-	25	-	25	50	-
4.	PH-788A	Methods in Theoretical Physics	PG-14	2	1	1	-	2	-	25	-	25	50	-
		OR												
	PH-788B	Experimental Techniques	PG-14	2	2	1	-	-	-	-	50	-	50	-

6.3.10 Considered the recommendations of the Chemical Engineering Department for dropping out the 4 credits CH-601-A/601-B/601-C of third semester of M.Tech. programme and merging credits of these courses with the credits of dissertation and thus increasing the credits for dissertation from 32 to 36:

RESOLVED that as considered and recommended by the Board PGS&R and in the light of MHRD guidelines, the recommendations of Chemical Engineering Department for dropping 4 credits from CH-601-A/601-B/601-C of the third semester of M.Tech. programme and merging credits of these courses with the credits for dissertation and thus increasing the credits of dissertation from 32 to 36 be approved with the proviso that the quality of projects should substantially go up.

6.3.11 To consider the recommendations of the DRC/DFB of Architecture & Planning Deptt. that outstanding B. Arch./M.Arch./Master in any branch of Architecture and Planning including Housing of Urban Design or equivalent like P.G. Diploma available by CEPT may also be included in the eligible qualifications for admission to Ph.D. Programmers in Arch. & Planning Deptt. on the conditions similar to B.Tech. candidates.

RESOLVED that as considered and recommended by the Board, the degree of the M.Arch/M.U.R.P/ B.Arch. be also included in the qualifications for minimum eligibility criteria for admission to Ph.D. programme are as under:

(a) Masters degree in Engineering /Technology/**Architecture / MURP** /Sciences / Humanities & Social Sciences and Management in respective discipline or equivalent with a minimum Cumulative Grade Point Average (CGPA) of 6.75 on a 10 point scale or equivalent as determined by the Institute wherever letter grades are awarded; or 60% marks in aggregate (of all the years/semesters) where marks are awarded.

OR

Applicants with B. Tech. /**B. Arch**. degree or equivalent in respective discipline with excellent academic record (with a minimum CGPA of 7.5 on a 10 point scale or equivalent or 70% marks) may be considered eligible for admission.

(b) Applicants for admission for full-time studies who do not possess an M.Tech. /**M.Arch. /MURP** degree or equivalent in the relevant field must have a valid GATE score (at least 75 percentile) for Engineering /Technology/Architecture/M.U.R.P./ Science discipline or must have qualified national level fellowship examinations such as NET (JRF/LS) conducted by UGC/CSIR for Science/Humanities and Social Sciences disciplines.

Note: The additions are shown in bold type.

6.3.12 Considered the recommendations of the Faculty Board of Electrical Engg. Department to increase 12 seats with assistantship in M.Tech. programmes of the Department:

RESOLVED that as considered and recommended by the Board, PGS&R in the meeting held on 17th April 2003, the proposal to increase the intake by 03 seats with assistantships in each of the 04 M.Tech. programmes in the Department of Electrical Engineering, be approved from the year 2003-2004.

6.3.13 Considered the curricular structure and syllabi for the new Masters Programme in Advanced Chemical Analysis in the Department of Chemistry:

RESOLVED that as considered and recommended by the Board, PGS&R in the meeting held on 17th April 2003, the curricular structure and syllabi for the new Masters Programme in Advanced Chemical Analysis in the Department of Chemistry be approved as given at **Appendix 'B'** with the following provisions:

1. Prerequisites for all the courses will be specified.
2. The title of the course No. CY-712 be changed to "Data Analysis and Computer Applications in Chemistry".

6.3.14 Considered the proposal from Civil Engineering Department to rename M.Tech. (Remote Sensing & Photogrammetry Engg.) degree course to M.Tech. (Geomatics Engineering).

RESOLVED that as considered and recommended by the Board, PGS&R in the meeting held on 17th April 2003, the proposal of the Department of Civil Engineering to rename the M.Tech. (Remote Sensing & Photogrammetry Engg.) degree course to M.Tech. (Geomatics Engineering) be accepted, and placed before the Board for approval.

6.3.15 Considered the proposal of Chemistry Department to float six Pre-Ph.D. courses alongwith curricular structure and syllabi:

RESOLVED that as considered and recommended by the Board, PGS&R in the meeting held on 17th April 2003, the proposal of Chemistry

Department to float six Pre-Ph.D. courses alongwith curricular structure and syllabi as given at **Appendix 'C'** be approved with the following changes in the weightages:

(a) The CWS for course No. CY-907 and CY-908 Seminar I & II will be nil.

(b) The MTE for course No. CY-907 and CY-908 Seminar I & II will be 50.

The amended structure is given at **Appendix 'D'**

6.3.16 Considered the recommendations of the WRDTC for filling some seats in PG/M.Tech. programmes at the Centre through non-sponsored GATE qualified candidates:

This item was deferred.

6.3.17 Considered the Academic Calendar for Autumn Semester of Session 2003-2004 (From July 02, 2003 to January 05, 2003):

RESOLVED that the Academic Calendar for Autumn Semester of Session 2003-2004 (From July 02, 2003 to January 05, 2003) be approved with minor changes. **Appendix –'E'** refers.

6.3.18 Considered the modified proposal to start a new M.Tech. programme on Industrial Safety Hazard Management:

RESOLVED that as considered and recommended by the Board, PGS&R in the meeting held on 17th April 2003, the modified proposal to start a new M.Tech. programme on Industrial Safety Hazards Management as given in **Appendix 'F'**, be approved:

6.3.19 Considered the changes in the U.G. Regulation No. 6.1(h):

RESOLVED that the under mentioned revised clause No. 6.1 (h) of the UG Regulations be approved:

6.1 (h) One self-study course may be offered under special circumstances from the list of regular courses of study, to a student in his/her final semester or thereafter when he/she is short by a maximum of 6 earned credits to become eligible for the degree. Student shall be awarded a maximum of 'B' grade in the course. This course shall be offered only if approved by the Dean, UGS on the recommendation of the Chairman, DUGC with the proviso that the evaluation process will not be diluted.

6.4.0 REPORTING ITEMS:

6.4.1. Reported that on the recommendations of the ECS, the Director has approved the local and additional fees to be charged from the students admitted to various courses as given in Appendix 'G'.

Noted.

6.4.2 Report the latest policy framework for promotion of Post-Graduate Education & Research in Engineering & Technology by the Ministry of Human Resource Development (Department of Secondary & Higher Education), Govt. of India.

Noted. Further, the Senate decided that the cases of non-fellowship holders for fee waiver, be examined. All students with revised fellowship be charged the same fee.

6.4.3 Reported that the Director has approved the interpretation of clause No. R.2.3 (d) of the Ph.D. regulations as under with the condition that quality of students should be maintained even in the case of Part-Time Scholars.

The Senate noted the undermentioned interpretation of clause No.R.2.3(d) of the Ph.D. regulations:-

Since the condition of minimum residence at IITR or candidates who are working in Roorkee or in Organization/ Institutes located within a distance of 100 Km. from the Institute, it is envisaged that such candidates would be working at IITR as part-time and therefore this has no relevance whether the parent Institute of the candidate is recognized by our Institute or not and whether Institute is an R&D organization or a public sector Unit.

Nevertheless, they have to satisfy the admission eligibility and other requirements.

The meeting ended with a Vote of thanks to the Chair.

Course No. and Title : PH-785 Advanced Classical Physics

Semester : Autumn/Spring

Contact Hrs./Week :

L	T	P
3	1	0

Credits : 4

Course Objective : To familiarize students with problem solving in Classical Physics.

Course Contents :

Calculas of residuce and dispersion relations for complex functions solutions of non homogeneous equations through Green's function and numerical computation for physics problems. Sturm-Liouville theory-orthogonal functions. Vector spherical Harmonics, Chebyshev Polynomial-Numerical applications. Solution of integral equations and Green's function techniques.

Lagrangian gauge invariance and scale invariance, canonical transformations and Poisson brackets, Dynamics in a rotating coordinate system, Nonlinear dynamics and chaos, Geometry of space-time, Minkowski space, Lorentz invariance of intervals, Light cone, Relativistic Lagrangian and Hamiltonian functions, Relativistic kinematics of collisions and collision threshold energies.

Plane electromagnetic waves, Wave propagation, K.K. relations, Wave guides, Optical Fibres, Radiating Systems, Radiation, Scattering, Relativistic effects in electromagnetism, Covariance, Invariant Green functions, Collisions, Energy loss, Cherenkov radiation, Radiation by moving charges, Larmer's formula, Thomson scattering, Bremsstrahlung, Radiation damping.

Prerequisite : None

Books recommended:

Mathematical methods for Physicists (Academic Press, 5th Ed., 2001) - Arfken and Weber

Classical Mechanics (Narosa Publishing House, 1990) - H. Goldstein

Classical Electrodynamics (Prentice Hall of India, 2000) - D. J. Griffiths

Classical Electrodynamics (John Wiley, 1999, New York) - J. D. Jackson

Practical : None

Course No. and Title : PH-786 Advanced Quantum Physics

Semester : Autumn/Spring

Contact Hrs./Week :

L	T	P
3	1	0

Credits : 4

Course Objective : To familiarize students with problem solving in Quantum Physics.

Course Content :

Operator algebra, 1D and 3D problems, angular momentum algebra, Schrodinger, Heisenberg & Interaction pictures, scattering theory, phase shift analysis, Born approximation, WKB approximation, time independent & time dependent perturbation theory.

Spin-orbit interaction, fine structure, hyper-fine structure, magnetic resonance (EPR & NMR).

Canonical and grand canonical-partition function of classical systems, density matrix and its equation of motion, density matrix of spin-½ and spin-1 particle systems, partition function of ideal Fermi and Bose systems. Bose condensation and superfluidity.

Deutron problem, nuclear scattering, quarks and leptons, weak and strong interactions.

Bands and bonds in semiconductors, pn-junction & transistor action, quantum Hall effect, Superconductivity.

Prerequisite : None

Books recommended:

Quantum Mechanics - L. I. Schiff
(McGraw-Hill, 3rd Edition)

Quantum Mechanics - E. Merzbacher
(Wiley Internation, 2nd Edition, 1990)

Practical Quantum Mechanics - S. Flugge

Statistical Mechanics - R.K. Pathria
(Butterworth Heinemann, Oxford, 2001)

Practical : None

Course No. and Title	:	PH-787 Seminar
Semester	:	Autumn/Spring
Contact Hrs./Week	:	L T P
Credits	:	2
Course Objective	:	To familiarize students with Literature Survey and Presentation.
Course Content	:	A review of both theoretical and experimental aspects on a topic pertaining to new developments in physics.
Prerequisite	:	None
Books recommended	:	None
Practical	:	None

Course No. and Title : PH-788A Methods in Theoretical Physics

Semester : Autumn/Spring

Contact Hrs./Week :

L	T	P
1	1	0

Credits : 2

Course Objective : To familiarize students with current methods of theoretical physics.

Course Content : Second Quantization: Wave function ψ as field, creation and annihilation operators, Hamiltanion in second quantized form, Application to many electron systems and to many boson systems, Hartree-Fock method.

Green's functions: Green's function method to solve inhomogeneous differential equations. Its use in solving one-particle Schrodinger equation, Green's function for many particle systems, Green's function of electron system within Hartree-Fock approximation.

Prerequisite : None

Books recommended:

Many Electron Systems - S. Rajmes
(North Holland Publishing Co., 1990)

A Guide to Feynman Diagrams in the Many Body Problem - R.D. Mattuck
(McGraw-Hill International Book Co., 2nd Edition, 1976)

Practical : None

Course No. and Title : PH-788B Experimental Techniques

Semester : Autumn/Spring

Contact Hrs./Week :

L	T	P
2	1	0

Credits : 2

Course Objective : To familiarize students with basic experimental techniques.

Course Content :

Measurement Techniques: Transducer characteristics, System parameters, Static and dynamic performance analysis of measurement systems. Signal to noise ratio enhancement, Design of filters, Instrumentation Amplifier, Phase lock loop measurements.

Semiconductor Measurements: Lifetime, mobility and carrier concentration, Measurement techniques using various techniques like Deep Level Transient Spectroscopy.

Dielectric and Superconducting Properties: Measurement of dielectric constant and dielectric loss factor, Measurement of Superconducting properties like critical current and transition temperature.

Material Characterization: Elemental and Structural properties, Characterization using X-ray diffraction, X-ray emission spectroscopy, X-ray fluorescence methods, Energy and wavelength dispersive methods, TEM and SEM and Scanning Tunneling Microscope.

Thermal Analysis Techniques: DSC, DTA and TGA methods for various phase transition determination.

Prerequisite : None

Books recommended:

Instrumentation Devices and Systems (TMH, 2nd Ed., 1999)	-	C.S. Rangan, G.R. Sarma & V.S.V. Mani.
Measurement Systems (McGraw Hill, 1990)	-	E.O. Doebelin
Instrumental Methods of Analysis (CBS, 1986)	-	H.H.Willard, L.Merritt(Jr) J.A.Dean & F.A. Settle(Jr).
Semiconductor Measurements and Instrumentation (McGraw Hill, 1975)	-	W.R. Runyan

CHEMISTRY DEPARTMENT
ACADEMIC CURRICULUM M.TECH. (Advanced Chemical Analysis)

Teaching Scheme					Contact Hours per Week			Exam. Duration (Hrs.)		Relative Weightage (%)				
S. No.	SUBJECT CODE	COURSE TITLE	SUBJECT AREA	CREDITS	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1ST YEAR			I SEMESTER (AUTUMN)											
1.	MA-501 D	Advanced Mathematics	PG-11	4	3	1	-	3	-	25	-	25	50	-
2.	CY-711	Instrumental Techniques –I	PG-14	4	3	1	-	3	-	25	-	25	50	-
3.	CY-721	Instrumental Techniques –II	PG-14	4	3	1	-	3	-	25	-	25	50	-
4.	CY-731	Characterization of Materials	PG-13	4	3	1	-	3	-	25	-	25	50	-
5.	CY-741	Analysis of Foods & Drugs	PG-14	4	3	2	-	3	-	25	-	25	50	-
SUB TOTAL				20										
II SEMESTER (SPRING)														
1.	CY-712	Modeling, Simulation & Computer Applications	PG-12	4	3	2	-	3	-	25	-	25	50	-
2.		Major Elective- I	PG-14	4	3	1	-	3	-	25	-	25	50	-
3.		Major Elective-II	PG-14	4	3	1	-	3	-	25	-	25	50	-
4.	CY-722	Laboratory Methods-I	PG-14	4	-	-	8	-	3	-	25	25	-	25
5.	CY-732	Laboratory Methods-II	PG-14	4	-	-	8	-	3	-	25	25	-	25
6.		Minor Elective	PG-15	4	-	-	-	-	-	-	-	-	-	-
SUB TOTAL				24										
2ND YEAR			III SEMESTER (AUTUMN)											
1.	CY-811	Seminar	PG-18	4	-	-	-	-	-	-	-	-	-	-
2.	CY-821	Project	PG-19	6	-	-	-	-	-	-	-	-	-	-
3.	CY-831	Dissertation	PG-20	12	-	-	-	-	-	-	-	-	-	-
SUB TOTAL				22										
IV SEMESTER (SPRING)														
1.	CY-832	Dissertation (Contd. From III Semester)	PG-20	24	-	-	-	-	-	-	-	-	-	-
SUB TOTAL				24										
TOTAL				90										

CHEMISTRY DEPARTMENT
MAJOR ELECTIVES

M.TECH. (Advanced Chemical Analysis)

ELECTIVES		
1.	CY-742	Organometallics
2.	CY-752	Environmental Chemistry
3.	CY-762	Analysis of Materials
4.	CY-772	MORE COURSES TO BE ADDED LATER
5.	CY-782	
6.	CY-792	

Note: The optional course on Technical Communication HS-501 of 2 credits shall be offered so as not to disturb other courses & the normal timetable. The Faculty Advisor shall advise such students who are weak in Technical Communication to opt for this course in first Semester.

Course No. & Title : CY-711: Instrumental Techniques – I

Semester : Autumn

Contact Hours : L T P
3 1 0

Total Credits : 4

Prerequisite: Nil

Objective: To acquaint students with advanced instrumental techniques and their analytical applications in various fields of research and industry.

1. Chemical Instrumentation: Criteria for analytical measurements for environmental, clinical and quality control, general survey of various instrumental techniques, instrumental parameters, signal-to-noise ratio, sources of noise, dead time, instrument calibration and its maintenance, Standard Reference Materials, importance and availability, concept of quality assurance and quality management programme, total quality management, concept of ISO 9000.

(6H)

2. Nuclear Analytical Methods: Basic principle of methods based on radioactivity measurements, choice of radiotracers, advantages and limitations, Activation Methods – Neutron activation methods, principle, classification, methodology, instrumentation, multielemental and nondestructive character, interferences, cyclic and derivative activation analysis, typical applications for trace element analysis of various matrices, comparison with other methods such as XRF, ICP-AES etc. Isotope Dilution Analysis, using radiotracers and stable isotopes (ID-MS), basic principle and methodology, limitations, comparison with NAA, substoichiometric IDA. Other radiometric methods using radioreagents, radiometric titration, radiochromatography, Radioimmunoassay, their advantages and applications.

(16H)

3. Chromatographic Methods: General principles of solid-liquid, liquid-liquid and gas chromatography, Retention, Resolution and Separation factor, Plateconcept, Van Deemter equation, chromatographic column and detector characteristics, Applications in quantitative analysis– Kovat's index High Performance Liquid Chromatography– instrumentation, separation columns, detectors, interfacing with GC and HPLC with mass spectrometry, Reverse phase chromatography, ion chromatography– its comparison with ion exchange, applications, Inorganic ion exchangers–their classification and application in radioactive waste processing, Affinity chromatography and Gel filtration chromatography – basic principles and applications.

(12H)

4. Automation and Process Control: Requirements of automation, Automatic and automated devices, continuous and discrete analyzers, feedback control loop, On-line analyzer, automated process control, nondestructive automatic analyzer, automation in clinical, environmental analysis and quality control, Automated elemental analyzers, Laboratory robots.

(8H)

References:

1. H.H. Willard, L.L. Merritt, J.A. Dean, and F.A. Settle, Instrumental Methods of Analysis of Analysis, 7th Edn., Wadsworth Publishing Co., USA, 1988.

2. C. Vandecasteele and C.B. Block, Modern Methods of Trace Element Determination, John Wiley & Sons, New York, 1993.

3. R.L. Pecsok, L.D. Shields, T. Cairns and I.G. McWilliam, Modern Methods of Chemical Analysis, Second Edn., John Wiley & Sons, New York, 1976.

4. W.D. Ehmann and D.E. Vance, Radiochemistry and Nuclear Methods of Analysis, John Wiley & Sons, New York, 1991.

5. H. Bauer, G.D. Christian and J.E. O' Reilly, Instrumental Analysis, Allyn and Bacon, Boston, 1978.

6. D.A. Skoog, F.J. Holler and T.A. Nieman, Principles of Instrumental Analysis, 5th Edn, Harcourt Brace & Company, Philadelphia, 1998.

Course No. & Title : CY-721 : Instrumental Techniques– II

Semester : Autumn

Contact Hours : L T P
3 1 0

Total Credits : 4

Prerequisite: Nil

Objective: To familiarize the students with the recent techniques used for analysis of metal ions and organic/inorganic compounds.

1. Electroanalytical Methods: Voltammetric, potentiometric coulometric Methods: Principle, instrumentation, analytical applications of polarography, pulse and differential pulse polarography, cyclic voltammetry and alternating current cyclic voltammetry; chropnopotentiometry, anodic and cathodic stripping voltammetry, microelectrodes, modified electrodes and ion selective electrodes and their analytical applications, Electroseparations at controlled potential.

(15H)

2. Spectral Methods: Sources of atomic spectra Principle, instrumentation and applications of atomic absorption, atomic emission and atomic fluorescence, radiation sources, atomic absorption with flame and electro thermal atomizers, atomic emission based on flame and electrical excitation, photographic detection, photoelectric detection, Inductively coupled plasma atomic emission and its advantages, Spectral and chemical interferences in atomic spectroscopy, Evaluation of data.

(15H)

3. Mass Spectrometry: Principle, instrumentation including different types of ions sources and mass analyzers, resolution, interpretation of mass spectrum and analytical applications. Interfacing chromatography and ICP with mass spectrometry.

(6H)

4. Thermal Methods: General characteristics of thermal methods, Thermogravimetry, Differential Thermal Analysis-instrumentation, methodology and applications, factors affecting results, Thermometric titrations and their applications.

(6H)

References:

1. G.W. Ewing, Instrumental Methods of Chemical Analysis, McGraw Hill Book Company, Inc. (1975).
2. H.H. Willard, L.L. Merrilt, J.A. Dean, and D. Van Instrumental Methods of Analysis, Nostrand Company, Inc.(1971).
3. I.M. Kolthoff and P.J. Elving, Treatise on Analytical Chemistry, Part I Vol.5, Ed. Interscience Publications (1964).
4. R.L. Pecsok and L.D. Shields, Modern Methods of Chemical Analysis, John Wiley & Sons, Inc.
5. A.I. Vogel, A Test Book of Quantitative Inorganic Analysis, ELBS with Longmans (1995).
6. D.A. Skoog, D.M. West & F.J. Holler, Fundamental of Analytical Chemistry, Saunders College Publishers.
7. L. Meites, Polarographic Techniques, Interscience Publishers (1987).
8. I.M. Kolthoff & J.J. Lingane, Polarography, Interscience Publishers (1955).

Course No. & Title: CY-731 : Characterization of Materials

Semester : Autumn

Contact Hours : L T P
3 1 0

Credits : 4

Prerequisite: Nil

Objective: The objective of the course is to acquaint with methods used for characterization of materials based on structure and analysis.

1. X-Ray Methods: Nature of X-ray spectra, Monochromatization of X-rays; detection of X-rays – Gas isonization detectors, scintillation detectors, solid state ionization detectors.

   Absorption methods – absorption law, absorption edge analysis, absorption apparatus, applications.

   X-Ray emission spectroscopy – direct methods, X-ray fluorescence methods; fluorescence spectrometer – energy dispersive and wavelength dispersive x-ray spectrometers, applications.

   X-Ray diffraction methods – elements of repetition, concept of lattice, space groups, crystalline state and different crystal systems, scattering of X-rays by crystals, amplitude and phase of the resultant X-ray diffracted wave, structure factors, experimentation – powdered method, exptl set up, spacing and intensity of diffraction peaks, indexing, unit cell parameters and X-ray density, characterization of crystalline materials; single crystal methods of X-ray diffraction – moving camera methods, X-ray diffractometers, interpretation of diffraction data-geometrical interpretation of Bragg's Law, calculation of structures factors, phasing and indexing of diffraction maxima, electron density maps and structure determination, R-factors, applications.

   Thermal Methods – use of DSC (or DTA) and TGA in characterization of materials and phases.

   (20H)

2. Surface Spectroscopy: Ion scattering spectroscopy, elastic collisions, depth profiling, ion scattering spectrometer; X-Ray Photoelectron spectroscopy – chemical shift, XPS instrumentation, qualitative and quantitative analysis, scanning XPS/ESCA, photoelectron spectrum of some simple compounds; SEM/EDX – principles of scanning electron microscopy, electron – specimen interactions, imaging modes of SEM; elemental analysis by emitted X-rays; Auger electron spectroscopy – principle, instrumentation and applications.

   (15H)

3. Chemical Sensors: Membranes, electroactive materials, membrane potential, selectivity coefficients and their determination, discussion of some important ion and molecule sensors, applications.

   (7H)

References:

1. M.J.Burger; Crystal structure analysis, John Wiley & Sons Inc, N.Y. (1967)

2. Willard, Merrit, Dean & Settle; Instrumental Methods of Analysis; CBS Publishers, New Delhi. (1986)

3. GW. Ewing ; Instrumental Methods of Chemical Analysis; McGraw Hill Book Co., N.Y. (1975)

4. A.R. West; Solid State Chemistry and its applications, John Wiley & Sons, Singapore. (1994)

5. Moody and Thomas, Selective ion sensitive electrodes; Merrow Publishing Co., Watford. (1982)

6. P.W. Atkins, Physical Chemistry, Oxford University Press, Oxford, (1998).

Course No. & Title: CY-741 : Analysis of Foods and Drugs

Semester : Autumn

Contract Hours : L T P
3 1 0

Credits : 4

Prerequisite : Nil

Objective: To provide general methods used for the analysis of variety of food materials and drugs and analysis of common poisons.

1. Analysis of Basic constituents of Food: Moisture in case of dry, wet moist food, oils, fats and fatty emulsions etc.. Fat in case of fatty foods, volatile oil in case of spices, fibre determination in fibre containing food i.e. cereal, bread, spices (to determine quality of spices). Protein in all kinds of food. Ash: determination of sulfated ash, water soluble ash and silieous matter in vegetables, spices etc. Sugars in fruit juices and soft drinks. Acidity and volataile acidity. pH value.

(10H)

2. Analysis of Preservatives, Colouring matter and Contaminants: Determination of SO_2, benzoic acid, □ydroxyl benzoates, nitrites, nitrates used as preservatives. Analysis of antioxidants in fats, i.e. BHT, BHA and gallates. Colouring matter in soft drinks, alcoholic drinks, jam-jelly, sweets etc.. Contaminants, analysis of mercury, Arsenic and trace elements.

(8H)

3. Analysis of Drugs and Pharmaceuticals: General pharmacology, Qualitative aspects of drug action, Receptors, Role of absorption of drugs, Routes for administration and elimination of drugs, Gram positive and Gram negative organisms, 5-HT receptors and drugs acting on 5-HT, Non steroidal anti-inflammatory drugs.

   Analysis of chloramphenicol, chloroquine, phosphate, beta- methasone, amylbarbitone, analgin, ampicilline, ascorbic acid, aspirin and paraacetamol.

(14H)

4. Forensic Analysis of common poisons: Poisoning due to arsenic, lead, cadmium, mercury ad cyanide, General analytical approach. Cases studies – death due to fire, explosions, drug overdose cases. Alcohol – effects of alcohol, analysis of body fluid samples for alcohol, analysis of breath for alcohol. Analysis of body fluids – biological evidence, blood analysis, DNA analysis.

(10H)

References:

1. D. Pearson, Lab techniques in Food analysis, Butter Worth and Co. Ltd. 1973.
2. L.H. Mayer, Food Chemistry, The AVI Publishing Co. 1975.
3. A.J. Mac Leod, Instrumental Methods of Food Analysis, Elec Science, London, 1975.
4. ISI Handbook of Food Analysis, Indian Standards Institution, New Delhi.

Course No. & Title: CY-712 : Modeling, Simulation & Computer Applications

Semester : Spring

Contract Hours : L T P
3 1 0

Credits : 4

Prerequisite : Nil

Objective: To familiarize the students with basic computational methods and data analysis.

1. Computation:
Introduction to Digital computers, Representation of numbers, errors in floating point representation. Algorithms, Syntax of one higher level Language suitable for scientific computations (C or Fortran): Declarations, Assignment statement, Input/output statements, control structures for selection and Interaction, Functions. The array data structure. Numerical methods for solution of equations, integration, interpolation etc. Writing and implementation of simple programs and one individually assigned programming project.
(15H)

2. Probability:
Games of chance, Sample space, outcomes and events. Probability and frequency. Expectation and Variance. Discrete probability distributions: Bernoulli trails, Binomial distribution, Poisson distribution. Continuous distributions: Probability density functions, cumulative distribution functions: uniform, normal and exponential distributions. Sampling and representation of data: bar graphs, histograms, pie-charts etc. Measures of central tendency: mean, mode and median. Rank and percentile. Grouping and classification of data. Central limit theorem (on proof). Sampling distributions: Chi-square, Student's t and F-distributions. Estimation of mean and variance. Hypothesis testing.
(15H)

3. Treatment of Experimental Data:
Absolute and relative errors, precision and accuracy. Point and interval estimates of the mean and variance of measured values. Comparison between methods: Tests for significance of difference in means, paired comparison test. Test for comparability of variance. Treatment of bivariate data: Linear regression and correlation. Non-parametric tests: S gin test, rank-sum and signed rank tests. Use of Statistical packages for treatment of data.
(12H)

References:

1. V. Rajaraman, Computer Programming in C. Prentice-Hall of India, 1992
2. R.L. Anderson, Practical Statistics for Analytical Chemists, john Willey, 1970
3. E. Kreyszing, Introductory Mathematical Statistics: Principles and Methods, John Willey, 1970

Course No. & Title: CY-722 Laboratory Methods I

Semester : Spring

Contact Hours : L T P
0 0 8

Credit : 4

Prerequisite : Nil

Objective: Course will provide training in handling and applications of modern instrumental analytical techniques.

Experiments:

1. Simple determination of metal ions and simultaneous polarographic determination of two metal ions.
2. Polarographic / voltammetric estimation of colouring matters in food and dyes.
3. Powdered X-ray diffraction pattern of a cubic/tetragonal system and indexing of the pattern.
   (a) Determination of unit cell parameter.
   (b) Determination of number of molecules in a unit cell.
4. Identification of materials in a solid mixture by powder X-ray diffraction pattern.

Course No. & Title: CY-732 Laboratory Methods II

Semester : Spring

Contact Hours : L T P
0 0 8

Credit : 4

Prerequisite : Nil

Objective: Course will provide training in handling and applications of modern instrumental analytical techniques.

1. Experiment on separation and estimation of organic compounds using gas chromatography.

2. Use of IR spectroscopy in determination of the purity of commercial samples by compressed disc.

3. Experiment of radiochemistry based on the use of radio tracers.

4. Use of Atomic absorption spectroscopy in the estimation of metal contents in samples.

Course No. & Title: CY-742 ORGANO METALLICS

Semester : Spring

Contact Hours : L T P
3 1 0

Credits : 4

Prerequisite: Nil

Objective: To provide general knowledge about synthesis, reactions, mechanism and applications of organo metallic compounds.

1. Over view of the comparative aspects of synthesis, structure and bonding of different types of organometallic compounds: Ionic covalent-Main group compounds containing M-C σ bonds, metal alkyls and aryls, electron deficient organometallic compounds, compounds of transition metals: metal alkyls and acyl compounds. Organometallic compounds with π-bonding liqnads (non-classically bonded organomettalics), concept of hepaticity, 18 electron rule for π donor complexes, carbenes, alkylidenes, carbynes and alkylidynes; olefin or alkenyl, alkynyl, allyl, butadiene, complexes; cyclic π complexes, cyclobutadiene, cyclopentadienyl, arene, cycloheptatrienyl and cyclooctatetraene complexes.

(15H)

2. Organometallic Reactions and Mechanisms: Oxidative addition, insertion and cleavage reactions, reductive elimination reactions.

(5H)

3. Applications of Organometallics: Homogenous catalysis by transition-metal organometallics, the 16 and 18 electron rule in homogenous catalysis, hydroformylation, hydrogenation of olefins, olefins metathesis and Wacker Process.

(10H)

4. Metal Organic Chemical Vapour Deposition: Preparation and processing of advanced materials. Deposition of semiconductors: conducting and structural aspects; nanophase and nanoporous materials. Current methods for chemical synthesis of inorganic materials. Introduction to MOCVD, chemistry of precursors; their types, synthesis and purification, properties and applications of the materials.

(12H)

References:

1. B.E. Doughlas, D.H. Mc Daniel and J.J. Alexander, Concepts and Models of Inorg. Chem. 3rd Ed. John Wiley and Sons. Inc. 2001.
2. G. Wilkenson, F.G.A Stone and E.W. Abel, Eds., Comprehensive Organomtallic Chemistry, Pergamon Press, New York, 1995 Series IInd 1995.
3. P. Powell, Principles of Organometallic Chemistry 2nd Ed., Chapman and Hall, London 1988.

4. J.P. Callman, L.S. Hegedus, J.R. Norton and R.G. Fine Principles and Application of Organe transition Metal chemistry University Science Books, Mill Valley, CA 1987.

5. G.W. Parshall and S.D. Ittlell, Homogenous Catalysis, 2nd Ed., Wiley- Interscience, New York 1992.

6. C. Mastirs, Homogenous Transition-Metal catalysis, A. Gentt Art, Chapman and Hall, New York. 1981.

7. Ch. Elschenbroicj and A. Salzer, Organometallics: A Concis Introduction, 2nd Ed., VCH Publishers, New York. 1992.

8. A.C. Jones, Paul O'Brien, CVD of Compound semiconductor Wiley, VCH, 1971

9. W.S. Rees Jr. (Ed.,) CVD of Nonmetals, Wiley VCH 1996

10. U. Schubort and N. Husing, Synthesis of Inorganic Materials, Wiley VCH, 2000

11. S.B. Desu, D.B. Beach and P.C. Van Busteirk Ed., Metal-Organic Chemistry Vapour, Material Research Society, 1996

Course No. & Title: CY-752 ENVIRONMENTAL CHEMISTRY

Semester : Autumn

Contact Hours : L T P
3 1 0

Credit : 4

Prerequisite: Nil

Objective: To familarise the students with various analytical techniques used for the environmental analysis.

1. Chemistry and the Environment: Environment segments- ecosystem and natural cycles of the environment- chemical and photochemical reactions in the atmosphere- ozone chemistry- oxides of sulphur and nitrogen- organic compounds- green house effect and global warming- acid rain- environmental fate of pollutants- biological activity- biodegradation of carbohydrates, fats and oil, proteins, detergents, pesticides.

(9H)

2. Chemical Toxicology: toxic chemicals in the environment- toxic effects- biochemical effects of arsenic, cadmium, lead, mercury, copper, chromium- biochemical effects of some gaseous pollutants, cyanide, pesticides, asbestos- air pollutants- air quality standards- sampling and analysis- air pollution control- noise pollution- injurious effects of noise.

(9H)

3. Water Quality: Water quality parameters and standards- turbidity, color, pH, acidity, solids, hardness, chlorides, residual chlorine, sulfates, fluorides, phosphates, iron and manganese, nitrogen, DO, BOD, COD, grease, volatile acids- analytical techniques in water analysis- soil pollution.

(9H)

4. Wastewater Treatment: Primary treatment- equalization, neutralization, proportioning, sedimentation, oil separation, floatation, coagulation, aeration- air stripping of volatile organic, biological treatment process-lagoons, activated sludge process, trickling filtration, anaerobic decomposition, sludge handling and disposal.

(9H)

5. Adsorption and Oxidation Processes: Theory of adsorption- ion exchange process- chemical oxidation- advanced oxidation process miscellaneous treatment processes.

(6H)

References:

1. Anil Kumar De. "Environmental Chemistry", 3rd ed., Wiley Eastern Ltd. Chennai, 1994
2. M.S.Sethi, "Environmental Chemistry", Shri Sai Printographers, New Delhi, 1994.
3. Clair N. Sawyer, "Chemistry for Environmental Engineering", 4th Ed., McGraw Inc., 1994.

4. APHA-AWWA-WPCF, "Standard methods for the examination of water and wastewater", 17th Ed., Washington DC, 1989.

5. Metcalf &Eddy, "Wastewater Engineering:, 3rd Ed., McGraw Hill Inc., 1991.

6. W.Wesley, Eckenfelder, Jr., "Industrial Water Pollution Control", McGraw-Hill Company, 1989.

Course No. & Title: CY-762 Analysis of Materials

Semester : Spring

Contact Hours : L T P
3 1 0

Credits : 4

Prerequisite : Nil

Objective: The course will provide various methods used for analysis of variety of materials.

1. Steel, ferro and non-ferro alloys: Analysis of major constiuents such as combined and uncombined carbon, silicon, phosphorus and various metals present in stel, ferrochrome, ferromanganese, ferrovanadium, ferromolybdenum and ferrotungsten. Analyses of major constiuents in brass bronze gunmetal and white metal.

2. Analysis of constiuents of mortar and concrete. Classification of cement, various constituents of cement. Analysis of Portland cement with reference to insoluble residue, total silica, sesquioxides, lime and manganese.

3. Analysis of paints: Identification of thinner, vehicle and their analysis. Classification of pigments, analysis of various consitutuent in different pigments, varnishes, Catalysed coating and metal lacquers.

4. Oils, lubricants and greases: Testing of lubricating and allied oils with reference to viscosity and viscosity index, cloud and pour points, flash and fire points, aniline points, neutralisation number, total acid number, Koettsdoerfer number and iodine value. Mechanical stability of a greases, determination of penetration number and dropping point of a grease, Analysis and characterization of petroleum products.

5. Detergents: Various constituent of detergents, quantitative analysis of anionic, cationic, amphoteric, ampholytic and zwitterionic surfactants. Determination and identification of major organic components: sodium carboxymethyl cellulose, NTA, EDTA, organic bleaches and inorganic constituents. Analysis of soap products.

Bood Recommended

1. B.C. Agarwal & S.P. Jain, Metallurgical Analysis, Khanna Publications, Delhi. (1996)

2. O.P. Virmani & A.K. Narula, Applied Chemistry: Theory & Practice, New Age International Publishers, New Delhi. (1995)

3. G.F. Longman, The Analysis of Detergents & Detergent Products, Jhon Wiley & Sons. (1985).

CURRICULAR STRUCTURE OF PRE-PH.D. COURSES IN CHEMISTRY

Teaching Scheme					Contact Hours per Week			Exam. Duration (Hrs.)		Relative Weightage (%)				
S. No.	SUBJECT CODE	COURSE TITLE	SUBJECT AREA	CREDITS	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CY-901	Symmetry, Group Theory & Structure	PG-13	4	3	1	-	3	-	25	-	25	50	-
2.	CY-902	Applied Electro-analytical Chemistry	PG-13	4	3	1	-	3	-	25	-	25	50	-
3.	CY-903	Biosynthesis of Natural Products	PG-13	3	2	1	-	3	-	25	-	25	50	-
4.	CY-904	Applications of Radioactivity	PG-13	4	3	1	-	3	-	25	-	25	50	-
5.	CY-905	Advanced Photo & Radiation Chemistry.	PG-13	4	3	1	-	3	-	25	-	25	50	-
6.	CY-906	Chemistry of Transition Metals	PG-13	4	3	1	-	3	-	25	-	25	50	-
7.	CY-907	Seminar - I	PG-17	2	-	-	4	-	-	50	-	-	50	-
8.	CY-908	Seminar - II	PG-17	2	-	-	4	-	-	50	-	-	50	-

Pre-Ph. D. Course

Course No. & Title: CY-901 Symmetry, Group Theory & Structure

Semester : Autumn/Spring

Contact Hours : L T P
3 1 0

Credits : 4

Prerequisite: B. Tech/M.Sc./M.Tech.

Objective: To introduce the concept of symmetry with regard to spectroscopy and structure and to acquaint with the methods of structure determination.

Symmetry:

Concept of symmetry, symmetry operations, point symmetry, symmetry point groups, classification of molecules into respective symmetry point groups, the order of the group.

(4H)

Group Theory

Requirements of a group subject to group theoretical rules, symmetry operations as a group, representations of a group, Characters of representations, character tables and symmetry species, analysis of reducible representation.

(4H)

Applications to Spectroscopy:

Symmetry properties of molecular motions, 3n dimensional representation and its analysis; symmetry of vibrational modes, molecular orbitals, ground and excited states; selectional rules for electronic and vibrational spectroscopy, IR and Raman active fundamentals; symmetry requirements for coupling, overtones, combination bands and Fermi resonance; Geometry expected IR and Raman spectra of some C_{2v} and C_{3v} molecules – H_2O, SF_4, CH_3Cl, NH_3.

(6H)

Structure:

Concept of structure, amorphous and crystalline state, molecular and crystal structure, repeating schemes, six crystal systems, space symmetry and space groups.

(3H)

Crystal structure determination:

Diffraction methods, X-ray diffraction, scattering of X-rays by an atom, atomic scattering factor, combination of scattered X-rays-Aragand diagram, structure factors and phase of resultant X-ray waves, importance of systematic absences; Experimental methods – powdered and single crystal methods; powdered X-ray diffraction – photographic and diffractrometer methods, 'd' spacings, intensities and peak shape, effect of particle size, indexing of powdered pattern, limitations and advantages, characterization of materials.

(9H)

Single Crystal Methods:

Rotating crystal and moving camera methods, single crystal X-ray diffractrometer; treatment and interpretation of diffraction data – reciprocal lattice, Geometrical interpretation of Bragg's Law, indexing and intensity of diffraction maximas; Lorentz Polarization and absorption corrections, phase problem, direct and heavy atom method of phasing, structure factor calculations, Fourier series and electron density maps, structure refinement and R-factor.

(10H)

Limitations of X-ray diffractions, neutron diffraction:

Neutronsources, detection of neutrons, scattering cross sections, applications to molecular structure.

(2H)

Surface morphology/structure:

SEM/EDX, principles of scanning electron microscopy, electron-specimen interactions, imaging modes of SEM; Elemental analysis by X-rays, energy dispersive X-ray spectrometers, applications.

(4H)

References:

1. H. H. Jaffe & M. Orchin, Symmetry in Chemistry, Willey Eastern Pvt. Ltd., New Delhi. (1971)
2. M.J. Buerjer, Crystal structure analysis, John Wiley and Sons Inc, NY. (1967)
3. M.J. Buerjer, X-ray crystallography, John Wiley and Sons Inc, NY. (1966)
4. R.S. Drago, Physical Methods in Inoganic Chemistry; Affiliated East-West Press Pvt. Ltd., New Delhi., (1971)
5. A. R. West, Solid State Chemistry and its Applications, John Wiley & Sons, Singapore. (1994)
6. G.W. Ewing, Instrumental Methods of Chemical Analysis; Mc.Graw Hill Book Company, N.Y. (1996)
7. F.A. Cotton, Chemical Application of Group Theory, John Wiley & Sons, N.Y. (1992).
8. P.W. Atkins, Physical Chemical, Oxford University Press, Oxford, (1998)

PRE-Ph.D. COURSE

Course No. & Title: CY-902 Applied Electroanalytical Chemistry

Semester : Autumn/Spring

Contact Hours : L T P
3 1 0

Credit : 4

Prerequisite : B. Tech./ M. Sc./ M. Tech.

Objectives:

Course exposes the students to various voltammetric and coulometricy techniques and their analytical applications as well as their application in elucidating the redox mechanism. Concepts of polarography, linear and cyclic voltammetry and their application in the study of coupled chemical reactions shall be discussed. Besides, bulk electrolysis techniques, analytical applications of stripping techniques and theory and practical utility of sensors shall also be discussed.

Polarogaphy:

Basics of polarography, reference and working electrodes. Operational amplifiers concept and designing of circuits using Op-Amps., adsorption, kinetic, catalytic and diffusion currents and tests to distinguish them. Ilkovic equation, diffusion current constant and capillary characteristics determination. Role of temperature on diffusion current. Reversible, quasi-reversible and irreversible electrode reactions and evaluation of parameters viz., α, $K^{o}_{f,h}$, $D^{o1/2}$ etc. Role of polarography in determining stability constant of metal complexes.

Limitations of polarography, advancements in polarography-pulse and differential pulse polarography, Determination of sulfonamides, azoles, saframycins etc. using dpp.

(10H)

Voltammetry:

Linear and cyclic sweep voltammetry. Randle's Sevcik equations for reversible and irreversible reactions. Adsorption complications in voltammetry. Tests for electrode reactions coupled with chemical reaction; EC, CE and ECE reactions. Application of voltammetry in the study of unstable reaction intermediates.Detailed study of redox-mechanism and kinetics for simple biomolecules.

(10H)

Enzyme catalysed reactions and applications of voltammetry in monitoring such reactions. Electrochemical and enzymatic oxidation of uric acid.

(4H)

Controlled Potential Electrolysis:

Basic idea of bulk electrolysis reaction and its use in determining n-value of the reaction. Chronoamperometry and chronopotentiometry – general idea about instrumentation and their applications in determining half life of unstable intermediates. Double potential step chronoamperometry. Hyphenated techniques in combination with electrochemical studies for elucidating the mechanism of reactions. Spectroelectrochemistry.

Practical applications of electrochemistry in the synthesis of large number of organic compounds, dimerization reactions and unique synthesis.

(10H)

Stripping Techniques:

Hanging mercury drop electrode, Anodic and cathodic stripping voltammetry and their applications in the trace determination of metal ions and biologically important compounds.

(4H)

Sensors:

Ionic and chemical sensors – preparation properties and applications in determination of variety of metal ions.

(4H)

References:

1. P. H. Reiger, Electrochemistry Prentice-Hall International, N. J. (1995)
2. R. N. Adams, Electrochemistry at solid electrodes Marcel Dekker, N.Y. (1961)
3. G. Dryhurst, Electrochemistry of biomolecules Academic Press, N.Y. (1978)
4. H. Lund and M.M. Baizer, Organic Electrochemistry, Marcel Dekker, N. Y.(2000)
5. A.J. Bard & L.R. Faulkner, Electrochemical methods – fundamentals and applications, John Wiley and Sons, New York.(2001)

Pre-PhD Course

Course No. & Title: CY-903 Biosynthesis of Natural Products

Semester : Autumn/ Spring

Contact Hours : L T P
2 1 0

Credit : 3

Prerequisite : B.Tech/M/Sc/M.Tech.

Objective: To familiarize the scholars with biogenetic/biosynthetic pathways used in the production of natural products (organic molecules)

Secondary Metabolism: The Building Blocks and Construction Mechanism

Biogenesis and biosynthesis, building blocks, alkylation reactions- nucleophilic substitution, electrophilic addition, Wagner-Meerwein rearrangement, Aldol and Claisen reactions, Schiff base formation and Mannich reaction, transamination, decarboxylation reactions, oxidation and reduction reactions.

(6H)

Acetate Pathway

Biosynthesis of fatty acids, aromatic polyketides, cyclisation reactions, tetracyclines

(6H)

Mevalonate Pathway

Formation of polyisoprene chains, hemiterpenes, monoterpenes, sesquiterpenes,squalene, steroids, cholesterol, vitamin D, diterpenes, tetraterpenes, carotenes, vitamin A

(8H)

The Shikimate Pathway

Aromatic amino acids, simple benzoic acids, cinnamic acids, coumarins, flavonoids, isoflavonoids.

(6H)

Biosynthesis of Alkaloids

Alkaloids derived from ornithine, lysine, nicotinic acid, tyrosine, tryptophan, anthranilic acid.

(6H)

References:

1. Medicinal Natural Products, A Biosynthetic Approach, 2nd Edition, 2002 John Wiley & Sons, Ltd
2. Chemical Aspects of Biosynthesis, J. Mann Oxford Chemistry Printers (1994),

3. J.Mann, R.S. Davidson J.B. Hobbs, D.V.Banthorpe and J.B. Harborne, Natural Products: Their Chemistry and Biological Significance, Long man, Harlow (1994)
4. K.B.G. Torsell, Natural Product Chemistry, A Mechanistic, Biosynthetic and Ecological Approach, Apotekarsocieteten, Stockholm (1997)
5. J. D. Bu'Lock, The Biosynthesis of Natural Product, McGraw-Hill Publ.Co., London (1995)
6. U. Weiss and J..M. Edwards, The Biosynthesis of Aromatic Compounds, A Wiley Int. Science Publ (1980)

Pre-Ph.D. Course

Course No. & Title: CY-904 Applications of Radioactivity

Semester : Autumn/Spring

Contact Hours : L T P
3 1 0

Credits : 4

Prerequisite : B.Tech/M/Sc/M.Tech.

Objective: To familiarize scholars with applications of radioactivity in various fields of chemistry, biology, industry including hazards of radioactive waste.

Introduction:

Natural and Artificial radioactivity, radioactive equilibrium, semi- empirical mass equation, Radiation units, exposure and dose rate, Nuclear properties, Nuclear Models, Nuclide Chart. (4H)

Interaction of Radiation and Detection Methods:

Processes involved in the interaction of radiations with matter, General properties of detectors, Gas counters, Scintillation and semiconductor detectors, Electronics for counting systems, Absolute disintegration rate, Counting statistics.

(4H)

Production of Radionuclides:

Energetics of Nuclear reaction and irradiation yield, Target considerations and product specifications, Preparation of labeled compounds, Fast radiochemical separations, synthesis of Transuranium elements

(5H)

Radioanalytical Methods:

Principles and advantages, Neutron activation analysis, activation by charged particles and photons, Isotope dilution and substoichiometric methods, Radioimmunoassary.

(6H)

Applications of Radiotracers:

Chemistry of tracer concentrations, Applications to general chemistry, Radiometric titrations and Radiochromatography, Applications to biology and medicine including radiation therapy, Application in physiological and metabolic studies, industrial uses of tracers.

(6H)

Radiation Biology and Radiation Hazards:

Basic human physiology, Radiations effects in cell, Somatic and genetic effects of Radiation, radiation effects in plants, Safety regulations, Radiation monitoring.

(5H)

Nuclear Power and Reactors:

Energy production by nuclear fission, nuclear fuel and fuel cycle, fuel elements, Nuclear reactor-moderators and coolants, various types of power and research reactors, Thermal and fast breeder reactors, Indian Scenario.

(6H)

Radioactive waste:

Classification, treatment and disposal, Storage of radioactive waste, Release of radioactivity in the environment and its consequences, Transport regulations and legislation.

(4H)

Radionuclides in the Environment:

Release of radioactivity and its effects, actinides in atmosphere, migration of radionuclides from the repository, radionuclides in biosphere.

(2H)

References:

1. K.H.Lieser, Nuclear and Radiochemistry, Second Edn. Wiley-VCH, Berlin, 2001
2. J.P.Adloff and R. Guillaumont, Fundamentals of Radiochemistry, CRC Press, Boca Raton ,1993
3. G. Choppin, J.O.Liljenzin and J. Rydberg, Radiochemistry and Nuclear Chemistry, Butterworth-Heinemann, Oxford, 1996
4. S.K.Aggarwal and D.D.Sood, Facets of Nuclear Science and Technology, Eds., Department of Atomic Energy, Mumbai, 1996
5. D,D.Sood, Nuclear Materials, Indian Association of Nuclear Chemists and Allied Scientists, BARC, Mumbai, 1996.
6. W.D. Ehmann and D.E. Vance, Radiochemistry and Nuclear Methods of Analysis, John Wiley and sons, New Yord, 1991

Pre-Ph.D. Course

Course No. & Title: CY-905 Advanced Photo-and Radiation Chemistry

Semester : Autumn/Spring

Contact Hours : L T P
4 3 1

Credit : 4

Prerequisite : B.Tech/M.Sc/M.Tech.

Objective: This course will provide a background for the kinetic analysis of ultrafast processes occurring in chemical systems using advanced photo- and radiation chemical methods. These methods are also useful for the development of certain new materials.

General Overview

A review of kinetic methods for the study of fast reactions in the context of recent advancements. (2H)

Photochemistry and Radiation Chemistry – Perspectives and Applications

Photochemistry – Photochemistry of polyatomic molecules, primary photophysical and photochemical processes in polyatomic systems – photoredox, photoaddition, photosubstitution photoisomerisation and photocatalytic reactions.

(5H)

Lasers:

Principle of lasing action, types of lasers, laser induced photophysical, photochemical and photobiological processes.

(4H)

Radiation Chemistry:

Energetics of ionizing radiation, interaction of radiation with mater, LET effects, time scale of early events in radiation chemical processes, radiolysis of aqueous and non-aqueous system, generation of primary and secondary free radicals – their rates of production and redox reactivity in aqueous system.

(6H)

Time Resolved Kinetic Methods and their applications in the analysis of reaction mechanism:

Conventional fast kinetic techniques – flow method, relaxation techniques, molecular beam method and flash photolysis.

(3H)

Laser flash photolysis:

Nano- and picosecond set up, femtochemistry, transient ESR spectroscopy, single photon counter, Laser Raman spectroscopy.

(6H)

Pulse Radiolysis:

Linear accelerator, RF photocathode electron guns for studying kinetics in nano – and picosecond time scale combined radiation and photochemical techniques for the analysis of complex reactions of transients.

Applications of the above methods to understand the fundamental dynamic processes in the development of certain new materials.

(7H)

References:

1. J.G. Calvert and J.N. Pitts, Photochemistry, John Wiley and Sons Inc. (1967)
2. N.J. Turro, Modern Molecular Photochemistry, The Benjamin/Cummings Publishing Co. Inc., California (1978)
3. J.R.Lakowicz, Principles of Fluorescence spectroscopy, Plenum Press, New York (1999).
4. R.J.Silbey and R.A. Alberty, Physical Chemistry, John Wiley & Sons. Inc., New York (2002).
5. P.W. Atkins, Physical Chemistry, ELBS with Oxford University Press, London (1994)
6. G.Vanttecke and K.K.Karkustis, Guide to Lasers in Chemistry, Jones and Bartlett, Boston (1998).
7. J.W.T. Spinks and R.J. Woods, An introduction to Radiation Chemistry, John Wiley & Sons., New York.
8. J.F. Wishart and D.G. Nocera, Photochemistry and Radiation Chemistry, American Chemical Society, Advances in Chemistry Series 254, USA (1998)

Pre-Ph.D. Course

Course No. & Title: CY-906 Chemistry of Transition Metals

Semester : Autumn/Spring

Contact Hours : L T P
4 3 1

Credit : 4

Prerequisite : B.Tech/M.Sc/M.Tech.

Objective: This course aims to provide a theoretical background of bonding and spactra of transition metal compound including metallo porphyrin, phthallocyanin 'and their analogs. It also aims to acquaint with modern structural method of inorganic chemistry.

Group theoretical treatment of CFT & MOT in octahedral and tetrahedral system. Angular Overlap model of lower symmetry systems. Bonding in metallocenes, arenes and halfsandwitch compounds.

(10H)

Electronic spectra of coordination compounds: Atomic state, types of electronic transitions in coordination compounds, selection rules, breakdown of selection rules. Orgel and Tanbe-Sugano Diagramas. Calculation of ligand field parameters.

(8H)

Redox-reactions: Outer sphere mechanisms, Marcus theory, Hetero nuclear redox reactions. Inner sphere reactions of type I and II. Role of bridging ligand, remote attack, conjugation and orbital symmetry in inner sphere reactions. Photochemical reactions.

(8H)

Porphyrin, phthalocyanin and porphyrazine tetrapyrrolic systems: Their synthesis spectral and redox behavior. Structure, bonding and spectra of iron, nickel and copper tetrapyrrolic systems.

(8H)

Applications of EXAFS, ESCA, ESR and NMR in the structural illucidation of coordination compounds. Cyclic voltammetry- Interpretation of cyclic voltammograms, coupled chemical reactions- EE and EEE mechanisms.

(8H)

References:

1. F.A. Cotton, Chemical Applications of Group Theory- 2nd Edition, John Wiley and sons. 1992.
2. M. Grelock and E.C. Constable, Transition metal Chemistry, VCH Publishers, 1994.
3. B.E. Dogalas, D. Mc Daniel and J. Alexander, Concepts and Models of Inorganic Chemistry- 3rd Edition, John Wiley and sons. 2001.
4. J.A. Cowan Inorganic Biochemistry, VCH Publishers, 1992.
5. A.B.P Lever, Inorganic Electronic Spectroscopy 2nd Edition, Elesevier -1983.
6. J.A. Mc Cleverty and T.J. Meyer (Editors) Comprehensive Coordination Chemistry, Pergamon Press -1988
7. N.N. Greenwook and E.A. Earnshaw, Chemistry of Elements, Pergamon Press- 1985.
8. Inorganic Chemistry Principles of structure and Reactivity 4th Edition J.E. Huheey Collins College Publisher New York 1993.

PRE-Ph.D. SEMINAR

CY-907 SEMINAR - I

CREDIT – 2

COURSE CONTENT: Seminar on the topic of Chemistry relative to their Ph.D. problems in order to have a depth knowledge on the related aspects of the subject.

PRE-Ph.D. SEMINAR

CY-907 SEMINAR - II

CREDIT – 2

COURSE CONTENT: Seminar on the topic of Chemistry relative to their Ph.D. problems in order to have a depth knowledge on the related aspects of the subject.

CURRICULAR STRUCTURE OF PRE-PH.D. COURSES IN CHEMISTRY

Teaching Scheme					Contact Hours per Week			Exam. Duration (Hrs.)		Relative Weightage (%)				
S. No.	SUBJECT CODE	COURSE TITLE	SUBJECT AREA	CREDITS	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CY-901	Symmetry, Group Theory & Structure	PG-13	4	3	1	-	3	-	25	-	25	50	-
2.	CY-902	Applied Electro-analytical Chemistry	PG-13	4	3	1	-	3	-	25	-	25	50	-
3.	CY-903	Biosynthesis of Natural Products	PG-13	3	2	1	-	3	-	25	-	25	50	-
4.	CY-904	Applications of Radioactivity	PG-13	4	3	1	-	3	-	25	-	25	50	-
5.	CY-905	Advanced Photo & Radiation Chemistry.	PG-13	4	3	1	-	3	-	25	-	25	50	-
6.	CY-906	Chemistry of Transition Metals	PG-13	4	3	1	-	3	-	25	-	25	50	-
7.	CY-907	Seminar - I	PG-17	2	-	-	4	-	-	-	-	50	50	-
8.	CY-908	Seminar - II	PG-17	2	-	-	4	-	-	-	-	50	50	-

E

APPENDIX-E
Item No.6.3.17

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

ACADEMIC CALENDAR FOR THE AUTUMN SEMESTER OF THE SESSION 2003 – 2004
(FROM JULY 02, 2003 TO JANUARY 05,2004)

J.E.E. COUNSELLING FOR B.TECH/B.ARCH PROGRAMME	JULY 02-05, 2003	WED- SAT.
J.E.E. ARCH/DESIGN APTITUDE TEST	JULY 05, 2003	SATURDAY
EXAMINATIONS FOR SUMMER TERM CLASSES.	JULY 08-11, 2003	TUE – FRI
INSTITUTE REOPENS FOR THE SESSION 2003-2004.	JULY 14, 2003	MONDAY
DECLARATION OF RESULTS FOR SUMMER TERM EXAM.	JULY 14, 2003	MONDAY
REGISTRATION FOR ALL PG COURSES (NEW ENTRANTS).	JULY 29 ,2003	TUESDAY
REGISTRATION FOR ALL UG COURSES (NEW ENTRANTS).	JULY 30, ,2003	WEDNESDAY
COUNSELLING FOR VACANT SEATS (ALL PG COURSES) AND LAST DAY OF ADMISSION TO PG COURSES	JULY 31, 2003	THURSDAY
ORIENTATION FOR NEW ENTRANTS (UG/PG)	JULY 31, 2003	THURSDAY
CLASSES BEGIN FOR NEW ENTRANTS (UG/PG).	AUGUST 01, 2003	FRIDAY
REGISTRATION FOR ALL UG COURSES (OTHER THAN NEW ENTRANTS).	AUGUST 01, 2003	FRIDAY
CLASSES BEGIN FOR ALL UG COURSES (OTHER THAN NEW ENTRANTS).	AUGUST 04, 2003	MONDAY
REGISTRATION FOR ALL PG COURSES (OTHER THAN NEW ENTRANTS), Ph.D SCHOLARS AND B.TECH PREPRATORY COURSE.	AUGUST 04, 2003	MONDAY
CLASSES BEGAN FOR ALL PG CLASSES (OTHER THAN NEW ENTRANTS) AND B.TECH PREPRATORY COURSE	AUGUST 05, 2003	TUESDAY
DISPLAY/ASSIGNMENT OF UG PROJECT PROBLEMS	AUGUST 05, 2003	TUESDAY
SUBJECT REGISTRATION OF UG /PG STUDENTS/Ph.D. SCHOLARS (NEW ENTRANTS).	AUG 11-14 2003	MON – THU
AR (ACD) TO INTIMATE TO THE DEPARTMENTS THE NAMES OF THE INSTITUTE ELECTIVES TO BE RUN BY THE VARIOUS DEPTTS. IN SPRING SEMESTER OF 2003-2004 SESSION.	AUGUST 21, 2003	THURSDAY
DOSW TO SEND LIST OF STUDENTS REGISTERED FOR VARIOUS PROFICIENCIES TO CHIEF ADVISORS/ OC NCC/ AR (ACD).	AUGUST 29,2003	FRIDAY
AR (ACD) TO SEND TO DEPTTS FINAL LISTS OF REGISTERED STUDENTS.	SEPTEMBER 01, 2 003	MONDAY
MID TERM EXAM.-I FOR ALL UG/PG STUDENTS INCLUDING PREPRATORY COURSE FOR UG COURSES	SEPT 11-12, 2003	TH & FRI
DEPTTS. TO SEND TO AR (ACD) LISTS OF INSTITUTE ELECTIVES TO BE RUN IN SPRING SEMESTER – 2003-2004	SEPTEMBER 15, 2003	MONDAY
LAST DATE FOR WITHDRAWL FROM A COURSE.	SEPTEMBER 15, 2003	MONDAY
LAST DATE FOR DISPLAY OF ATTENDANCE RECORD OF STUDENTS FALLING SHORT OF MINIMUM ATTENDANCE REQUIREMENTS DURING THE MIDDLE OF SEMESTER (BY DEPARTMENTS)	SEPTEMBER 25, 2003	THURSDAY
AR (ACD.) TO INVITE APPLLICATIONS FROM UG STUDENTS FOR INSTITUTE ELECTIVES.	SEPTEMBER 26, 2003	FRIDAY
SEMESTER BREAK (FOR STUDENTS ONLY) **	SEPT 29-OCT 03, 2003	MON-FRI
LAST DATE FOR SUBMISSION OF M.PHIL/M.TECH (ES) DISSERTATION FOR THOSE TO WHOM EXTENTION HAS BEEN GRANTED ON SPECIAL GROUNDS.	SEPTEMBER 30, 2003	TUESDAY
LAST DATE OF SUBMISSION OF DOCUMENTS BY ALL NEW ENTRANTS	SEPTEMBER 30, 2003	TUESDAY
INTIMATION TO PARENTS/GUARDIANS OF STUDENTS HAVING "SHORT ATTENDANCE" BY A.R.(ACADEMIC)	OCTOBER 03, 2003	FRIDAY

AR (ACD) TO SEND TO HODS LIST OF INSTITUTE ELECTIVES OPTED BY STUDENTS FOR SPRING SEMESTER 2003-2004	OCTOBE5R 15, 2003 WEDNESDAY
MID TERM EXAM. II FOR ALL UG/PG STUDENTS INCLUDING PREPRATORY COURSE FOR UG COURSES	OCT. 22& 23, 2003 WED & THU
FINALIZATION OF TIME TABLES BY ALL DEPARTMENTS	NOV. 04-05, 2003 TUE & WED
PROVISIONAL SUBJECT REGISTRATION FOR SPRING SEMESTER FOR THE SESSION 2003-2004	NOV. 05-06, 2003 WED & THU
AR (ACD.) TO NOTIFY SEATING PLAN FOR AUTUMN SEMESTER EXAM	NOVEMBER 07, 2003 FRIDAY
AR (ACD.) TO NOTIFY DATES OF EXAM FOR COMMON SUBJECTS	NOVEMBER 10, 2003 MONDAY
FILLING OF RESPONSE FORMS BY UG/PG STUDENTS IN THE RESPECTIVE DEPARTMENTS	NOVEMBER 21`, 2003 FRIDAY 3.00 - 5.30 PM
ANNUAL CONVOCATION-2003	TO BE DECIDED
FOUNDATION DAY	NOVEMBER 25, 2003 TUESDAY
LAST DATE OF TEACHING FOR ALL UG/PG CLASSES.	NOVEMBER 25, 2003 TUESDAY
DISPLAY OF COURSE WORK EVALUTION	NOVEMBER 27,2003 THURSDAY
NOTICES TO STUDENTS' NOTICE BOARDS REGARDING SHORTAGE OF ATTENDANCE (BY DEPARTMENTS)	NOVEMBER 27, 2003 THURSDAY
ACTION BY AR (ACD) TO ASCERTAIN THAT THE DETAINED STUDENTS DO NOT APPEAR IN EXAM.	NOVEMBER 27, 2003 THURSDAY
*END TERM EXAM. FOR ALL CLASSES INCLUDING PREPRATORY COURSE FOR UG COURSES	NOV 28-DEC 6, 2003 FRI –SAT
DISPLAY OF GRADES FOR ALL EXAMS (BY DEPARTMENTS)	DECEMBER 15, 2003 MONDAY
WINTER VACATIONS **	DEC 16-31, 2003 TUE – WED
LAST DATE FOR SENDING OF GRADES TO AR (ACD) FOR ALL UG/PG COURSES	DECEMBER 19, 2003 FRIDAY
LAST DATE FOR DECLARATION OF AUTUMN SEMESTER RESULTS	DECEMBER 24, 2003 WEDNESDAY
SPRING SEMESTER 2003-2004 BEGINS	JANUARY 01, 2004 THURSDAY
REGISTRATION FOR ALL UG COURSES AND PREPRATORY COURSE	JANUARY 01, 2004 THURSDAY
CALSSES BEGIN FOR ALL UG COURSES AND PREPRATORY COURSE	JANUARY 02, 2004 FRIDAY
REGISTRATION OF ALL PG COURSES	JANUARY 02, 2004 FRIDAY
CLASSES BEGIN FOR ALL PG COURSES	JANUARY 05, 2004 MONDAY
REGISTRATION FOR ALL Ph.D. SCHOLARS	JANUARY 05, 2004 MONDAY
BUFFER DAY	NOVEMBER 27, 2003 THURSDAY

* The departments will organize the Practical Examinations during the last practical engagement of a particular batch/class before November 25, 2003

** Teaching staff can avail vacation

Note: - Heads of Department will plan the functions / Seminar on Saturdays and Sundays so that the Institute is able to maintain the Minimum Teaching days required in a semester.

List of Holidays –2003.

Aug 15(F) Independence Day, **Aug 20(W)** Janmashtami, **Oct 02(Th)** Mahatma Gandhi 's Birthday, **Oct 04(Sa)** Dussehra(Vijaya Dashmi), **Oct 25(Sa)** Deepawali, **Nov 08(Sa)** Guru Nanak's Birthday, **Nov 26(W)** Idul Fitar ***, **Dec 25 (Th)** Christmas Day

*** **In the event of change in the date of above holiday announced by the Govt. of India through the media, (TV/AIR/Newspaper-etc.) on account of the appearance of the Moon, the Institute shall automatically observe the subject holiday accordingly and no notice in this regard shall be issued.**

Teaching days for Autumn Semester 2003-2004

(a) Mondays 15 days, (b) Tuesdays 15 days, (c) Wednesdays 14 days, (d) Thursdays 14 days (e) Fridays 14 days = 72 days

APPENDIX-
Item 6.3.18

Course No. & Title : **CH-546: HAZARDOUS WASTE MANAGEMENT**

Semester : SPRING

Contact Hours :

L	T	P
3	1	0

Credits : 4

Prerequisite(s) : None

Objective :

To provide a comprehensive coverage of treatment, utilization and management of hazardous wastes.

Short Syllabus :

- Characterization of industrial wastes-hazardous and non-hazardous wastes. Waste disposal and management laws and guidelines.
- Non-hazardous industrial wastes-treatment, disposal, utilization and management. Thermal gasification, combustion and landfill. Value-extraction from the wastes.
- Hazardous wastes: handling, storage and disposal of hazardous wastes. Wastes from electroplating, lead batteries/cells, soldering and electro winning operations, wastes from refineries and petrochemical units.
- Case studies of a few real scenarios of hazardous waste management in industries.

Suggested Text Books:

1. Tedder, D. W. & Pohland, F. G. (editors), "Emerging Technologies in Hazardous Waste Management", ACS (1990)
2. Conway, R. A. & Ross, R. D., "Handbook of Industrial Waste Disposal", Van-Nostrand Reinhold (1980)

Course No. & Title : CH-502C: MODELING OF PROCESS SAFETY AND CONTROL SYSTEMS

Semester : SPRING

Contact Hours :

L	T	P
3	1	0

Credits : 4

Prerequisite(s) : None

Objective :

To educate the students about the modeling methodologies for Chemical Engineering Systems involving safety and their utility in designs of control systems.

Short Syllabus :

Models, need of models and their classification, models based on transport phenomena principles, scaling, alternate classifications of models, population balance, stochastic, and empirical models; Source models, flashing liquids, liquid pool evaporation and boiling; Toxic release and dispersion models; models for fire & explosion control; models of two phase flow during runaway reaction relief; Leung models for reactors and vessels.

Suggested Text Books:

1. Himmelblau, D.M. & Bischoff, K.B., "Process Analysis & Simulation, Deterministic Systems", Wiley (1968)
2. Crowl, D. A. & Louvar, J. F., "Chemical Process Safety : Fundamentals with Applications", Prentice Hall (1990)
3. Lees, F. P., "Loss Prevention in the Process Industries", Vol I, II & III, 2nd ed. Butterworth Heinemann (1996)

CH-544 Design of Safety Systems

Cr	L	T	P
4	3	1	05

Aim : To make aware the students of the need to design safety systems in the industries.

Course Content :

Importance of safety in design; Relief concepts, definitions, Emergency relief system design, DIERS/DIERS users group, ERS design basis; Impact of two-phase flow, codes, terms devices & rules; vessel disengagement dynamics, vapour-liquid disengagement modes; prediction of two-phase flow onset/disengagement; vent flow dynamics.

Determining Pressure relief, types of relief devices, Design of relief systems; Deflagration venting for dust and vapour explosions, venting system design for fires external to process vessels, Reliefs for thermal systems, Flare design for toxic release from industries.

Advances in fire prevention and control systems.

Text Books :

1. F.P. Lees, "Loss Prevention in the Process – Industries", 2nd ed. Butterworths, London, 1996.
2. Crowl, D.A. & Douvar, Joseph, "Chemical Process Safety Fundamentals with Applications", Prentice Hall, New Jersey (1990).

Major Elective I

CH-548 Case Studies in Safety and Hazards Management

Cr	L	T	P
4	3	1	0

Aim & Objectives : To explain to the students few cases of industrial disasters and to make them aware of improved procedures to prevent such disasters

Contents :

Accident processes – causes and consequences. Case histories in general categories, static electricity, chemical reactivity, material failure, fire and explosion, system design and management procedures.

Text Books :

1. F.P. Lees, "Loss Prevention in the Process Industries" 2nd Ed. Vol. 3, Butterworths, London (1996).
2. Ta.A. Kletz, "What went Wrong? Case Histories of Process Plant Disasters", Gulf Publishing, Houston (1985).
3. T.A. Kletz, "Plant Design for Safety", Hemisphere Publishing, NY (1991).

CH-550 Laws for Safety & Hazards

Cr	L	T	P
4	3	1	0

Aim & Objectives :

To make the students aware of various legislatins and rules framed-thereunder to deal with industrial safety, hygiene and hazards management.

Prerequisite : None

Course Contents :

The legislative frame work for the management of environmental loss due to industrial hazards and the factories regulation and hygiene. The Environment (Protection) Act, 1986, and Rules, 1986, The Hazardous Waste (Management and Handling) Rules, 1989, The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically engineered Organisms or Cells, 1989, The chemical Accidents (Emergency Planning, Prepareduces and Response) Rules, 1996. The Factories Act, 1948 with its amendments, BIS codes for safety and hazards management, Federal Register Legislations of U.S.A. for comparative assessment of Indian Laws and Rules.

Text Books :

1. Acts & Rules and Notifications as published in the Gazette of India from time to time.

CH-523 Reliability Engineering

Cr	L	T	P
4	3	1	0

Aim & Objectives : To understand the failure and reliability concepts of industrial systems

Prerequisite : None

Introduction to probability theory, failure mechanisms and distributions, moment generating functions, theory of chaos and catastrophic failure models, series, parallel, k-out-of –m configurations, stand-by-arrangements, Markov models and computer simulations, methods for computing system reliability, availability, and expected number of failures, reliability upgradation, fault tree, event tree and consequence modelling. Probabilistic approaches and applications.

Text Books :

1. CCPS, "Guidelines for Hazard Evaluation Procedures, AIChE, 2nd Edn. 1992
2. F.P. Lees, "Loss Prevention in the Process Industries", 2nd Ed., Butterworths, London, 1996.
3. J.F. Louvar and B.D. Louvar, "Health and Environmental Risk Analysis : Fundamentals with Applications, Prentice Hall, 1998.

CH-521 Fire Science & Engineering

Cr	L	T	P
4	3	1	-

Aim : To understand the basics of fire, its propagation and its prevention and control aspects in industrial environment.

Pre requisite : **None**

Short Syllabus :

Fire, combustion and explosion, flammability characteristics of chemicals and materials : liquids, vapours, gaseous/vapourous mixtures, gas-liquid two phase mixtures, flame propagation, Flammability diagram, ignition energy, autoignition and auto oxidation, fire initiation and propagation-severity and duration, adiabatic ignition temperature, effect of enclosure and heat transfer in fire development, stack and pool fires. Critical aspects of fire dynamics, diffusion flame and fire plumes, flame spread, production and movement of smoke, computer simulations of fire dynamics. Fire detection systems. Fire prevention and control : Engineering aspects of fire prevention and control, inerting procedures, static electricity – charge accumulation, electrostatic discharging, charge balancing in flow systems, static electricity control techniques, - general design methods, flame arrestors- their design, design of sprinkler systems, flare design, fire extinguishment – different methods.

Advances in fire prevention and control systems.

Text Books :

1. F.P. Lees, "Loss Prevention in the Process – Industries", Vol. 1 & 2, Butterworths, London (1996).
2. D.R. Stull, "Fundamentals of Fire and explosion", AIChE Monograph Series, (New York) (1977).

DEPARTMENT OF CHEMICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

PROPOSED SCHEME OF TEACHING AND EXAMINATION OF M.Tech. INDUSTRIAL SAFETY & HAZARDS MANAGEMENT

SEMESTER - I

Code	Subject	Subject Area	Credits	L	T	P	TED	PED	THE	PE	MTE	CWS	PRS
MA-501B	Advanced Mathematics (Module -2)	PG-11	4	3	1	-	3	--	50%	--	20%	30%	--
CH-501	Transport Phenomena	PG-13	4	3	1	-	3	--	50%	--	20%	30%	--
CH-503	Chemical Reactor Analysis	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
CH-521	Fire Science & Engineering	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
CH-523	Reliability Engineering	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
	TOTAL		**20**	**15**	**05**	**-**							

SEMESTER - II

Code	Subject	Subject Area	Credits	L	T	P	TED	PED	THE	PE	MTE	CWS	PRS
CH-502C	Modeling of Process Safety and Control Systems	PG-12	4	3	1	-	3	--	50%	--	20%	30%	--
CH-530	Industrial Safety & Hazards Mgt.	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
CH-544	Design of Safety Systems	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
	Major Elective I*	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
	Major Elective II*	PG-14	4	3	1	-	3	--	50%	--	20%	30%	--
	Minor Specialisation**	PG-15	4	3	1	-	3	--	50%	--	20%	30%	--
	TOTAL		**24**	**15**	**05**	**8**							

* A student has to opt for one course from the list of Major Electives given in Annexure – A.

** A student has to opt for one course out of the courses running in other specialization groups from the Department as well as outside the department.

NOTE: Students may opt **HS-501: Technical Communication** course of **2 credits (2 L & 1 T)** on the advice of the **FACULTY ADVISOR** during Autumn / Spring semester. The credits of this course will be over and above the total credits required for M. Tech. Degree.

SEMESTER - III

Code	Subject	Subject Area	Credits	L	T	P	TED	PED	THE	PE	MTE	CWS	PRS
CH-603	Project	PG-19	4	-	-	8	-	2	--	50%	--	--	50%
CH-605	Seminar	PG-18	4	-	-	2	-	2	--	50%	--	--	50%
CH-602	Dissertation	PG-20	16	-	-	24	-	2	--	100%	--	--	--
	TOTAL		**24**	**-**	**-**	**34**							

SEMESTER – IV

Code	Subject	Subject Area	Credits	L	T	P	TED	PED	THE	PE	MTE	CWS	PRS
CH-602	Dissertation	PG-20	20	-	-	40	-	2	--	100%	--	--	--
	TOTAL		**20**	**-**	**-**	**40**							

NOTE: The portion of the dissertation work of 16 credits carried out in the Semester-III shall be examined at the end of 3rd semester and the evaluation shall be recorded as "Satisfactory" or "Unsatisfactory" with grade 'S' or 'U', respectively. For SGPA of 3rd semester / CGPA up to 3rd semester, only the credits of course, seminar and project shall be taken into account. If the dissertation is graded unsatisfactory (U) he/she shall cease to get scholarship / assistanceship in the fourth semester and he/she shall not be awarded a grade higher than B Plus (B+) at the end of fourth semester. The final evaluation of the Dissertation of 32 credits shall be carried out in the 4th semester.

DEPARTMENT OF CHEMICAL ENGINEERING
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ANNEXURE – A

LIST OF COURSES FOR M. Tech. INDUSTRIAL SAFETY & HAZARDS MGT. STREAM

MAJOR ELECTIVE I

1. CH-546: Hazardous Waste Mgt.
2. CH-548: Case Studies in Safety and Hazards Mgt.
3. CH-550: Laws for Safety & Hazards — To be offered by Met. & Materials Engg. Deptt.
4. MT-517: Failure Analysis — To be offered by Electrical Engg. Deptt.
5. EE- : Electrical Safety

MAJOR ELECTIVE I I

1. CH-512: Optimization of Chemical Processes
2. CH-516: Data Acquisition & Monitoring
3. CH-518: Experimental Design Parameter Estimation & Data Analysis — To be offered by Electrical Engg. Deptt.
4. EE-521: Advanced Industrial & Electronic Instrumentation — To be offered by Met. & Materials Engg. Deptt.
5. MT-539: Inspection & Quality Control

APPENDIX-G

Item No. 6.41

Statement of Local and Additional Fees to be charged from the B.Tech./ B.Arch./ Five Year Programme Dual Degree students.

Particulars	Fees to be charged
I. Semester Fees (To be paid every Semester)	
a) Institute Fees	
1. Tuition Fees	As approved by IIT Council
2. Examination Fees	350/-
3. Registration/Enrolment Fees	150/-
4. Medical Fees	50/-
5. Internet & Computer charges	500/-
6. Extra Curricular Activity	600/-
7. Medical Fund (DOSW Discretionary Fund)	100/-
Total	**1750/-**
b) Hostel Fees	
1. Hostel seat rent	100/-
2. Fan, Electricity and water charges	400/-
3. Common facility in Bhawans other than rent	600/-
Total	**1100/-**
II *One time payments*	
a) At the Time of Admission	
1. Admission Fees	200/-
2. Grade Card	150/-
3. Student welfare fund	300/-
4. Modernization fees	200/-
5. Identity Card	40/-
6. Benevolent Fund	100/-
7. Alumni Fees (By non member s only)	500/-
8. Courses of study	100/-
Total	**1590/-**
b) Others	
1. G.I.S.	60/-
2. Industrial tour (to be paid in 3rd Semester only)	1000/-**
3. Bhawan Fund (Yearly)	100
III Deposits (Refundable)	
1. Institute Caution Deposit	2000/-
2. Library Deposit	2000/-
Total	**4160/-**
Total Fees payable at the time of Admission	**8600.00**

* To be paid in second semester only

** To be paid in third semester only

Statement of Local and Additional Fees to be charged from the M.Tech. (Engg.) students

Particulars	Fees to be charged
I. Semester Fees (To be paid every Semester)	
a) Institute Fees	
1. Tuition Fees	As approved by IIT Council
2. Examination Fees	350/-
3. Registration /Enrolment Fees	150/-
4. Medical Fees	50/-
5. Internet & Computer charges	600/-
6. Extra Curricular Activity	600/-
7. Medical Fund (DOSW Discretionary Fund)	100/-
Total	**1850/-**
b) Hostel Fees	
1. Hostel seat rent	100/-
2. Fan, Electricity and water charges	400/-
3. Common facility in Bhawans other than rent	600/-
Total	**1100/-**
II *One time payments*	
a) At the Time of Admission	
1. Admission Fees	200/-
2. Thesis/ Dissertation Fees**	250/-**
3. Grade Card	150/-
4. Student welfare fund	300/-
5. Modernization fees	200/-
6. Identity Card	40/-
7. Benevolent Fund	100/-
8. Alumni Fees (By non member s only)	500/-
9. Course of study	100/-
Total	**1590/-**

b) Others	
1. G.I.S.	60/-
2. Bhawan Fund (Yearly)	100/-
III Deposits (Refundable)	
1. Institute Caution Deposit	1000/-
2. Library Deposit	2000/-
Total	**3160/-**
Total Fees payable at the time of Admission	**7700/-**

* To be paid in second semester only

** At the time of submission

Statement of Local and Additional Fees to be charged from the M.Sc./ M.Phil./ MCA students

Particulars	Fees to be charged
I. Semester Fees (To be paid every Semester)	
a) Institute Fees	
1. Tuition Fees	As approved by IIT Council
2. Examination Fees	350/-
3. Regn./Enrolment Fees	150/-
4. Medical Fees	50/-
5. Internet & Computer charges	500/-
6. Extra Curricular Activity	600/-
7. Medical Fund (DOSW Discretionary Fund)	100/-
Total	**1750/-**
b) Hostel Fees	
1. Hostel seat rent	100/-
2. Fan, Electricity and water charges	400/-
3. Common facility in Bhawans other than rent	600/-
Total	**1100/-**
II *One time payments*	
a) At the Time of Admission	
1. Admission Fees	200/-
2. Grade Card	150/-
3. Student welfare fund	300/-
4. Modernization fees	200/-
5. Identity Card	40/-
6. Benevolent Fund	100/-
7. Alumni Fees (By non member s only)	500/-
8. Course of study	100/-
Total	**1590/-**
b) Others	
1. G.I.S.	60/-
2. Bhawan Fund (Yearly)	100/-
III Deposits (Refundable)	
1. Institute Caution Deposit	1000/-
2. Library Deposit	2000/-
Total	**3160/-**
Total Fees payable at the time of Admission	**7600.00**

* To be paid in second semester only

Statement of Local and Additional Fees to be charged from the Ph.D. students

Particulars	Fees to be charged	
I. Semester Fees (To be paid every Semester)	F.T.	P.T.
a) Institute Fees		
1. Tuition Fees	As approved by IIT Council	
2. Examination Fees	350/-@	350/-@
3. Regn./Enrolment Fees	150/-	150/-
4. Medical Fees	50/-	50/-
5. Internet & Computer charges	750/-	750/-
6. Extra Curricular Activity	600/-	100/-
7. Medical Fund (DOSW Discretionary Fund)	100/-	100/-
Total	**2000/-**	**1500/-**
b) Hostel Fees		
1. Hostel seat rent	100/-	100/-@@
2. Fan, Electricity and water charges	400/-	400/-@@
3. Common facility in Bhawans other than rent	600/-	600/-@@
Total	**1100/-**	**1100/-**
II *One time payments*		
a) At the Time of Admission		
1. Admission Fees	200/-	200/-
2. Thesis/ Dissertation Fees	3000/-**	3000/-**
3. Grade Card	150/-	150/-
4. Medical	100/-	100/-
5. Student welfare fund	300/-	300/-
6. Modernization fees	200/-	200/-
7. Identity Card	40/-	40/-
8. Alumni Fees (By non members only)	500/-	500/
9. Course of study	100/-	100/-
Total	**1590/-**	**1590/-**

b) Others	F.T.	P.T
1. G.I.S.	60/-	60/-
5. Bhawan Fund (Yearly)	100/-	-
III Deposits (Refundable)	-	-
1. Institute Caution Deposit	2000/-	2000/-
2. Library Deposit	2000/-	2000/-
Total	**4160/-**	**4060/-**
Total Fees payable at the time of Admission	**8850.00**	**8250.00**

* To be paid in second semester only
** At the time of submission
@ For first semester only
@@ In a semester when residing

Statement of Local and Additional Fees to be charged from the MBA students

Particulars	Fees to be charged
I. Semester Fees (To be paid every Semester)	
a) Institute Fees	
1. Tuition Fees	As approved by IIT Council
2. Examination Fees	350/-
3. Regn./Enrolment Fees	150/-
4. Medical Fees	50/-
5. Internet & Computer charges	600/-
6. Extra Curricular Activity	600/-
7. Medical Fund (DOSW Discretionary Fund)	100/-
Total	**1850/-**
b) Hostel Fees	
1. Hostel seat Rent	100/-
2. Fan, Electricity and water charges	400/-
3. Common facility in Bhawans other than rent	600/-
Total	**1100/-**
II *One time payments*	
a) At the Time of Admission	
1. Admission Fees	200/-
2. Grade Card	150/-
3. Student welfare fund	300/-
4. Modernization fees	200/-
5. Identity Card	40/-
6. Benevolent Fund	100/-
7. Alumni Fees (By non member s only)	500/-
8. Course of study	100/-
Total	**1590/-**
b) Others	
1. G.I.S.	60/-
2. Industrial tour	300/-
3. Bhawan Fund (Yearly)	100/-
III Deposits (Refundable)	
1. Institute Caution Deposit	1000/-
2. Library Deposit	2000/-
Total	**3460/-**
Total Fees payable at the time of Admission	**8000.00**

* To be paid in second semester only