Minutes of the 25th Meeting of the Senate held on 23rd June 2008 at 03.00 P.M. in the Senate Hall of the Institute.

The following were present: -

1.	Prof. S.C. Saxema, Director	- Chairman
2.	Prof. R.P. Singh	(Biotechnology)
3.	Prof. Bikash Mohanty	(Chemical Engineering)
4.	Prof. Shri Chand	(Chemical Engineering)
5.	Prof. I.D. Mall	(Chemical Engineering)
6.	Prof. Vijay Kumar Agarwal	(Chemical Engineering)
7.	Prof. R.N. Goyal	(Chemistry)
8.	Prof. Ravi Bhushan	(Chemistry)
9.	Prof. Kamaluddin	(Chemistry)
10.	Prof. V.K. Gupta	(Chemistry)
11.	Prof. Anil Kumar	(Chemistry)
12.	Prof. M.R. Maurya	(Chemistry)
13.	Prof. U.P. Singh	(Chemistry)
14.	Prof. V.K. Gupta	(Civil Engineering)
15.	Prof. S. S. Jain	(Civil Engineering)
16.	Prof. Deepak Kashyap	(Civil Engineering)
17.	Prof. (Mrs.) Indu Mehrotra	(Civil Engineering)
18.	Prof. (Mrs) Renu Bhargava	(Civil Engineering)
19.	Prof. C.S.P. Ojha	(Civil Engineering)
20.	Prof. Mahendra Singh	(Civil Engineering)
21.	Prof. Manoj K. Arora	(Civil Engineering)
22.	Prof. M. Parida	(Civil Engineering)
23.	Prof. Praveen Kumar	(Civil Engineering)
24.	Prof. N.K. Samadhiya	(Civil Engineering)
25.	Prof. A.K. Ahuja	(Civil Engineering)
26.	Prof. D.K. Paul	(Earthquake Engineering)
27.	Prof. Ashwini Kumar	(Earthquake Engineering)
28.	Prof. H.R. Wason	(Earthquake Engineering)
29.	Prof. M.L. Sharma	(Earthquake Engineering)
30.	Prof. H. Sinvhal	(Earth Sciences)
31.	Prof. R.P. Gupta	(Earth Sciences)
32.	Prof. R. Anbalagan	(Earth Sciences)
33.	Prof. Mohd. Israil	(Earth Sciences)
34.	Prof. H.O. Gupta	(Electrical Engineering)
35.	Prof. Pramod Agarwal	(Electrical Engineering)
36.	Prof. S. P. Singh	(Electrical Engineering)
37.	Prof. S.P. Srivastava	(Electrical Engineering)
38.	Prof. R.P. Maheshwari	(Electrical Engineering)
39.	Prof. D.K. Mehra	(Electronics & Computer Engg.)
40.	Prof. S.N. Sinha	(Electronics & Computer Engg.)
41.	Prof. N.K. Goel	(Hydrology)

42.	Prof. S.P. Singh	(Humanities & Social Sciences)
43.	Prof. J.S. Upadhyay	(Paper Technology)
44.	Prof. G.S. Srivastava	(Mathematics)
45.	Prof. (Mrs.) R.R. Bhargava	(Mathematics)
46.	Prof. S.P. Sharma	(Mathematics)
47.	Prof. T.R. Gulati	(Mathematics)
48.	Prof. (Mrs.) Rama Bhargava	(Mathematics)
49.	Prof. R.C. Mittal	(Mathematics)
50.	Prof. V.K. Katiyar	(Mathematics)
51.	Prof. Roshan Lal	(Mathematics)
52.	Prof. Y.K. Gupta	(Mathematics)
53.	Prof. M.L. Mittal	(Mathematics)
54.	Prof. Pradeep Kumar	(Mechanical & Industrial Engg.)
55.	Prof. S.C. Sharma	(Mechanical & Industrial Engg.)
56.	Prof. Dinesh Kumar	(Mechanical & Industrial Engg.)
57.	Prof. Satya Prakash	(Metallurgical & Materials Engg.)
58.	Prof. Jagdish Rai	(Physics)
59.	Prof. Rajesh Srivastava	(Physics)
60.	Prof. D. Dass	(Water Resource Dev. & Management)
61.	Prof. Deepak Khare	(Water Resource Dev. & Management)
62.	Prof. A.K. Chaudhry	(Institute Instrumentation Centre)
63.	Prof. Karmeshu, JNU, Delhi	
64.	Prof. N.K. Sharma, IIT Kanpur	
65.	Mr. Arun Kumar, Head, AHEC	
66.	Mr. S. Chakravorty, Assistant Professor, Electronics & Computer Engg.	
67.	Dr. A.K. Sen, Associate Professor, Earth Sciences	
68.	Lt.Col. (Retd.) A.K. Srivastava, Registrar	- Secretary

At the outset, two minutes silence was observed by the Senate in the memory of late Prof. B.M.J. Pereira, Department of Biotechnology, former member of the Senate, who tragically passed away on 24th May 2008.

The Chairman (Director) welcomed the members to the 25th Meeting of the Senate.

Before taking up the agenda, the Director (Chairman, Senate) stated as under:

(1) As per Orders of the Government, reservation for the OBC candidates has been implemented. The Counselling for the JEE-2008 has been completed and all the seats of the OBC candidates have been filled.

(2) The Government has decided to set up 8 new Indian Institutes of Technology during the 11th Five Year Plan. In

order to closely monitor as well as facilitate the work of establishment of these eight new IITs, it has been decided that the existing IITs will mentor the new IITs for first 2-3 years or till these are properly set up as per the details given below:

Sl.No.	**Mentor IITs (existing)**	**Mentored IITs (new)**
1.	IIT Delhi	IIT Punjab
2.	IIT Guwahati	IIT Patna
3.	IIT Kharagpur	IIT Orissa
4.	IIT Roorkee	IIT Himachal Pradesh
5.	IIT Kanpur	IIT Rajasthan
6.	IIT Bombay	IIT Indore & IIT Gujarat
7.	IiT Madras	IIT Andhra Pradesh

(3) The Hon'ble Visitor has re-nominated Shri Jaiprakash Gaur as the Chairman of the Board of Governors of the Indian Institute of Technology Roorkee for another term of three years.

The Senate welcomed the under- mentioned new members and hoped for their valuable contribution and active participation in its deliberations:

1. Prof. M.L. Mittal, Department of Mathematics
2. Prof. M.L. Kansal, Department of WRD&M
3. Prof. Deepak Khare, Department of WRD&M
4. Prof. M.R. Maurya, Department of Chemistry
5. Prof. U.P. Singh, Department of Chemistry
6. Prof. Himanshu Joshi, Department of Hydrology
7. Prof. S.P. Srivastava, Department of Electrical Engineering
8. Prof. N.P. Padhy, Department of Electrical Engineering
9. Prof. Sunil Bajpai, Department of Earth Sciences
10. Prof. G.J. Chakrapani, Department of Earth Sciences
11. Prof. Mohd. Israil, Department of Earth Sciences
12. Prof. A.K. Ahuja, Department of Civil Engineering
13. Prof. M.L. Sharma, Department of Earthquake Engineering
14. Dr. A.K. Sen, Associate Professor, Department of Earth Sciences
15. Dr. Vinay Pant, Assistant Professor, Department of Electrical Engg.

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

1. Prof. B.D. Indu, Department of Physics
2. Prof. G.L. Asawa, Department of Civil Engineering
3. Prof. A.K. Awasthi, Department of Earth Sciences

4. Prof. M.L. Kansal, Department of WRD&M
5. Prof. Ishwar Singh, Department of Physics
6. Prof. S.K. Ghosh, Department of Civil Engineering
7. Prof. Satish Chandra, Department of Civil Engineering

The Agenda was then taken up:

Item No. 25.1.1: To confirm the minutes of the 23rd meeting of the Senate held on 6th February 2008 and 24th meeting held on 22nd February 2008, respectively.

The Senate confirmed the minutes of the 23rd meeting of the Senate held on 6th February 2008 and 24th meeting held on 22nd February 2008, respectively.

Item No. 25.1.2: To receive a report on the actions taken to implement the decisions taken by the Senate in its 23rd Meeting & 24th Meeting held on 06.02.2008 and 22.02.2008, respectively.

The Senate noted that the actions have been taken on the decisions taken by the Senate in its 23rd Meeting & 24th Meeting held on 06.02.2008 and 22.02.2008, respectively.

Item No. 25.2.1: To consider the Institutive Electives of Chemistry Department and Mathematics Department.

As considered and recommended by the Board, UGS, the Senate decided that the under-mentioned Institute Electives of the Department of Chemistry and Department of Mathematics as given at **Appendix 'A',** be approved:

(a) Department of Chemistry:

1. ICY-01 Fundamentals of Polymer Sciences
2. ICY-02 Nuclear Science and Technology

(b) Department of Mathematics

1. IMA-01 Advanced Engineering Mathematics
2. IMA-02 Applied Linear Algebra
3. IMA-03 Cryptography
4. IMA-04 Discrete Mathematical Structure

5. IMA-06 Finite Element Methods
6. IMA-07 Fuzzy Set Theory & Fuzzy Systems
7. IMA-08 Graph Theory
8. IMA-09 Mathematical Control Theory
9. IMA-10 Modelling with Differential and Difference Equations
10. IMA-11 Numerical Methods
11. IMA-12 Operations Research
12. IMA-13 Optimization Techniques
13. IMA-15 Robotics & Control

The Senate further decided that the under-mentioned Institute Electives be again placed before the Senate after incorporating the suggestions given by the Senators on the floor:

1. IMA-05 Ecological Statistics
2. IMA-14 Probabilistic Models for Engineers

Item No. 25.2.2: To consider the Institute Electives proposed by the Physics Department in new structure.

As considered and recommended by the Board, UGS, the Senate decided that the under-mentioned Institute Electives of the Department of Physics as given at **Appendix 'B',** be approved:

1. IPH-01 Quantum Devices
2. IPH-02 Nanomaterials
3. IPH-03 Fiber Optics
4. IPH-04 Space Science and Technology
5. IPH-05 Superconducting Materials & Devices
6. IPH-06 Applied Quantum Physics
7. IPH-07 Reactor Physics

Item No. 25.2.3: To consider the minimum educational qualification in M.Tech. Hydraulics Engineering Programme.

As considered and recommended by the Board, PGS&R, the Senate decided that the under-mentioned minimum educational qualification for admission to M.Tech. programme in Hydraulics Engineering be approved:

"Bachelor's degree in Civil Engineering/ Mechanical Engineering/ Chemical Engineering/ Agricultural Engineering or its equivalent".

Item No. 25.2.4: To consider the recognition of Central Pulp & Paper Research Institute, Saharanpur as Research Centre for pursuing Ph.D. programme.

The Senate decided that the proposal of the Department of Paper Technology, Saharanpur Campus to recognize Central Pulp & Paper Research Institute, Saharanpur as research organization for their candidates to pursue Ph.D. Programme under sponsored (Part-time) Category at IIT Roorkee be approved.

Item No. 25.2.5: To consider the syllabi of M.Tech. course in Nanotechnology.

As considered and recommended by the Board, PGS&R, the Senate decided that the syllabi of M.Tech. course in Nanotechnology as given at **Appendix 'C',** be approved.

Item No. 25.2.6: To consider the Academic Calendar for the Autumn Semester Session 2008-2009.

The Senate decided that the Academic Calendar for the Autumn Semester 2008-2009 Session as given at **Appendix 'D'** be approved.

Item No.25.2.7: To consider the recommendations of the committee constituted to frame the guidelines for the Distinguished Service Awards (DSA) to Alumni.

The Senate decided that the recommendations of the committee constituted to frame the guidelines for the Distinguished Service Awards (DSA) to Alumni be approved as under:

(a) A new category of "Service to the Society" may be added to the existing category of the Distinguished Alumni Award and further that in any one year not more than two Distinguished Alumni Awards (DAA) may be given in any one category restricting the total number up to four.

(b) The Alumni Association may consider the issue of instituting Distinguished Service Awards (DSA) for the Distinguished Service to the Alumni Association.

Item No.25.2.8: To consider the Curriculum Structure of B.Arch II year onwards.

The Senate decided that the corrections in the Curriculum structure of B.Arch. II year onwards in respect of the Civil Engineering Department be brought before the next meeting of the Senate.

Item No.25.2.9: To consider the modified syllabus as IPH-08 "Laser Physics & Quantum Opto Electronics".

As considered and recommended by the Board, UGS, the Senate decided that the Institute Elective on "Laser Physics & Quantum Electronics" of the Physics Department be approved as under:

(1) The Elective be renamed as "Laser Physics & Quantum Opto Electronics".

(2) PH-201 or its equivalent be made as its pre-requisite.

(3) The subject be renumbered as IPH-08.

The Senate further decided that the syllabus of IPH-08 as given at **Appendix 'E'** be also approved.

Item No.25.2.10: To consider the report of the Committee constituted to examine the security aspect of printing of transcripts.

The Senate decided that the recommendations of the committee constituted to examine the security aspect of printing of transcripts be approved, as under:

1. The names of all those who receive any degree from the Institute should be uploaded on the Institute website indicating the candidate's enrolment number, name, degree awarded and

discipline. This should start from the current year and go backwards to previous years as far as possible. It is hoped that this public disclosure of names and degrees awarded will discourage people from adopting malpractices.

2. The degree given by the Institute should have a hologram and blind embossing on the degree certificate to make it difficult to print counterfeit degrees.

3. The official stationery used for sending covering letters along with transcripts should also have holograms and blind embossing.

4. The following be printed on the reverse of the degrees:

"THIS DEGREE IS VALID ONLY IF IT BEARS BOTH THE HOLOGRAM AND THE EMBOSSING OF THE INSTITUTE'S LOGO."

Item No.25.2.11: To consider recognition of Instruments R&D Establishment (IRDE), Dehradun as Research Centre for pursuing Ph.D. Programme.

The Senate decided that as recommended by the Standing Committee, the request of the Director, IRDE, Dehradun for recognition IRDE, Dehradun as Research Centre to pursue Ph.D. Programme under sponsored (Part-time) Category at IIT Roorkee be approved.

Item No.25.2.12: To consider Engineering/Architecture graduates from IIT/University of Roorkee having high CGPA/ marks, without valid GATE Score for admission to Ph.D. Programme.

The Senate decided that the changes in clause R.2(1) of the Ordinance & Regulations for Doctor of Philosophy as under be recommended for approval to the Board of Governors:

Reg. No.	Existing	Proposed
R.2(1)	An applicant possessing the following qualifications in appropriate areas shall be eligible to apply for admission for Ph.D. programme of the Institute a) Masters degree in Engineering/Technology/Architecture/Urban & Rural Planning/ 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./March/ MURP degree or equivalent in the relevant field must have a valid GATE score (at least 75 percentile) for Engineering/ Technology/Science disciplines or must have qualified national level fellowship examinations such as NET (JRF/LS)	An applicant possessing the following qualifications in appropriate areas shall be eligible to apply for admission for Ph.D. programme of the Institute a) Masters degree in Engineering/Technology/Architecture/Urban & Rural Planning/ 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./March/ MURP degree or equivalent in the relevant field must have a valid GATE score (at least 75 percentile) for Engineering/ Technology/Science disciplines or must have qualified national level fellowship examinations such as NET (JRF/LS)

	conducted by UGC/CSIR for Science/ Humanities and Social Sciences disciplines.	conducted by UGC/CSIR for Science/ Humanities and Social Sciences disciplines. **c) Engineering/Architecture graduates from IIT/University of Roorkee having CGPA Score ≥ 8.00 or marks ≥80% .**

Item No.25.2.13: To consider the changes in some of the clauses of Senate Manual due to reorganization of UG & PG Sections.

As considered and recommended in the Joint meeting of the Boards, PGS&R & UGS, the Senate decided that modified Senate Manual as given at **Appendix 'F'** be recommended for approval to the Board of Governors.

Item No.25.2.14: To consider a report by Senate sub committee to examine in totality the issue of Mr. M.P.S. Chawla, Research Scholar, Department of Electrical Engineering.

The Senate considered the recommendations of the Senate sub-committee constituted to examine in totality the issue of Mr. M.P.S. Chawla, Research Scholar, Department of Electrical Engineering and approved as under:

1. The benefit of doubt be given to Mr. M.P.S. Chawla.

2. The case be closed. In view of benefit of doubt being given to Mr. M.P.S. Chawla, the restriction imposed regarding minimum period of one year for submission of Ph.D. thesis be condoned.

3. The issue related to copy right rules, publication norms and training to the students for writing technical papers be looked into by the IPR Cell.

4. The issue related to taking an undertaking from the students in respect of their theses/ research

papers etc. be looked into by the Ethics Committee of the Institute.

Further, the Senate took a serious view of Mr. M.P.S. Chawla disregarding the previous decision of the Senate and decided that he be suitably warned not to write to out side agencies without going through the laid down process for initiating cases for redressal of grievances.

Item No. 25.3.1: To report that the Director on the authorization of the Senate has approved the Teaching Scheme, minimum educational qualification, GATE discipline, syllabi, GATE disciplines wise distribution of students for the new M.Tech. Programme in 'Nanotechnology" to be started from the session 2008-2009.

Noted. Further, the requisite qualifications for admission to M.Tech. Programme be modified as under:

Name of the Programme	**M.Tech. in 'Nanotechnology'**
Total intake	15 students
Minimum educational qualifications:	GATE Qualified Students from any of the following disciplines: B.Tech. (Met. & Mat. Engg./ Mech. Engg./ E& C/ Electronics/ Chem. Engg./ Pulp & Paper/ Biotechnology or their equivalent); M.Sc. (Physics/ Chemistry/ Biotechnology or their equivalents) with Mathematics at 10 + 2 level.
Allowed GATE Disciplines with a Discipline Wise distribution of students	MT/ ME/EC/CH/CY/PH/XL MT/ME/EC/CH (Minimum 5) CY/PH/XL (Maximum 10)

Item No. 25.3.2: To report that the Director on the authorization of the Senate has approved the changes/ modification in GATE disciplines, No. of Seats as per GATE disciplines criteria etc. for the admission in Post Graduate Programmes for the year 2008.

Noted. Further decided that the format of Sponsorship Certificate required from full-time sponsored candidates as given at Annexure-2, page No. 98 of the Appendix 'A' , of the agenda item be reviewed.

Item No. 25.3.3: To report that the Director has approved the revision of tuition fee with effect from Academic Session 2008-2009.

The existing and revised tuition fee be noted as under:

Sl. No.	Programme	Existing Fee per semester (in Rs.)	Revised Fee per semester (in Rs.)	Remarks
1.	B.Tech./M.Sc. (Integrated)	13,500/-	25,000/-	Increased
2.	B.Tech./M.Tech. (Dual Degree)	13,500/-	25,000/-	Increased
3.	M.Sc. (2 year)	3,000/-	3,000/-	Unchanged
4.	M.Tech./ M.Tech.(ES)*	2,500/-	25,000/-	Increased
5.	M.B.A.	35,000/-	35,000/-	Unchanged
6.	M.C.A.	10,000/-	10,000/-	Unchanged
7.	Ph.D.	2,500/-	2,500/-	Unchanged

* Tuition fee waiver of Rs. 20,000/- will be available to Non-sponsored candidates.

There will be no change in the existing exemption of tuition fees for SC/ST students.

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

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: CHEMISTRY DEPARTMENT

1. Subject Code: **ICY- 01** Course Title: **Fundamentals of Polymer Science**

2. Contact Hours: L: 2 ,T: 1 P: 0

3. Examination Duration (Hrs.): **Theory** 2 **Practical** 0

4. Relative Weightage: **CWS** 25 **PRS** 0 **MTE** 25 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre- requisite: **Nil**

9. Objectives: **To introduce the fundamental and technological importance of polymers.**

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Introduction**: General idea of the polymers and their classifications, molecular forces and chemical bonding; Polymers in technological and biomedical fields.	4
2.	**Polymer Chains and Molecular Weights**: Degree of polymerization,number and weight average, molecular weights: Molecular weight dispersity and characteristics of polymers; Weight and composition heterogeneity in polymers; Polymer chain dimension and solution viscosity; Thermal and spectral characteristics of polymers.	6
3.	**Methods of Polymers Synthesis**: Synthesis of polymers using bulk, solution, emulsion, suspension and interfacial route of polymerization and characteristics of polymers; Addition and step growth polymers.	6
4.	**Technological Polymers**: Polymer blends, polymer composites, polymer films, resins, foams, polymer liquid crystals and engineering plastics, smart and responsive polymers, polymers for device applications, biodegradable polymers, conducting polymers.	6
5.	**Industrial Polymers**: Vinylic and phenolics, polyessters, polyamides, polyphosphazenes, polysilanes, polysiloxanes, coordination and organometallic polymers, polyacrylates.	6
	Total	28

Suggested Books:

S.No.	Authors/ Title/ Publisher	Year of Publication
1	Billmeyer Jr. F.W., **"Text Book of Polymer Science"**, 3rd Ed. ,Wiley-Interscience	1994
2	Fried J.R., **"Polymer Science and Technology"**, Prentice- Hall of India.	2002
3	Stevens M.P., **"Polymer Chemistry: An Introduction"**, 3rd Ed.,Oxford University Press.	1999
4	Seymour R.B. and Carraher Jr C.E., **"Polymer Chemistry"**, Marcel Dekker.	1991
5	Sinha R., **"Outlines of Polymer Technology: Manufacture of Polymers"**, Prentice- Hall of India.	2000

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: CHEMISTRY DEPARTMENT

1. Subject Code: **ICY- 02** Course Title: **Nuclear Sciences and Applications**

2. Contact Hours: L: **2** T: **1** P: **0**

3. Examination Duration (Hrs.): **Theory** 2 **Practical** 0

4. Relative Weightage: **CWS** 25 **PRS** 0 **MTE** 25 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both**

7.Pre- requisite: **Nil** 8 Subject Area: **BGSEC**

9.Objective of Course: Fundamental aspects of nuclear science and their applications will be introduced to the students.

11. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Basic Nuclear Science**: Elementary particles, nuclear stability, properties of nucleons, mass-energy relationship, nuclear models, radioactivity, decay methods, radioactive equilibrium, nuclear reaction.	7
2.	**Nuclear Detectors and Measurements**: Concept of α, β and γ radiation detection, different types of detectors – gas filled, scintillation, solid state, semiconductor .	5
3.	**Particle Accelerators and their Applications**: Cyclotron, Van de Graaf, Cockroft Walton, applications– ion implantation, material modification and characterization, nanostructured materials by ion beam, trace element mapping, nuclear dating .	8
4.	**Nuclear Reactor and Applications**: Types of nuclear reactor enrichment of radioisotopes, power generation, isotope production, isotope, radiotracer applications, radioimmunoassay, radiopharmaceuticals, neutron activation analysis.	8
	Total	28

11.Suggested Books:

S.No.	Authors/ Title/ Publisher	Year of Publication
1	Ehmann W.D., and Vance D.E., **"Radiochemistry and Nuclear Methods of Analysis"** John Wiley and Sons.	1991
2	Arnikar, H.J., **"Essentials of Nuclear Chemistry"** 4th Edition, New Age International (P) Ltd.	2003
3	Leiser K.H., **"Nuclear and Radiochemistry"**, 2nd Edition, Wiley-VCH.	2004
4	Bird, J.R. and Williams, J.S., (Eds.) **"Ion Beam for Material Analysis"** Academic Press, Inc.	1989

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-01** Course Title: **Advanced Engineering Mathematics**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective: To impart knowledge of essential mathematical tools of complex variables, partial differential equations and calculus of variation to engineering students

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Functions of a Complex Variable**: Analytic functions, conjugate harmonic functions, applications to the problems of potential flow.	6
2.	**Conformal Mapping**: Bilinear transforms, Schwarz-Christoffel transformations and their applications to engineering problems.	6
3.	**Complex Integration**: Line integrals, Cauchy integral theorem, Taylor's and Laurent's expansions, zeros and singularities, Cauchy residue theorem, contour integration and its applications.	10
4.	**Partial Differential Equations:** Solution of first order quasi linear equations, four standard forms of PDE, solution of first order non-linear PDE using Charpit's method, Solution of linear equations with constant coefficients, classification of second order PDE, solution of one dimensional wave and diffusion equations, Laplace equation in 2 and 3 dimensions.	12
5.	**Calculus of Variations:** Functionals, Euler's equations for one and several variables, isoperimetric problems, sufficient conditions for weak and strong maxima and minima, applications.	8
	Total	42

11. **Suggested Books:**

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Brown, J.A. and Churchill ,R.V.. **Complex Variables and Applications**, ,6th **Edition**, McGraw Hill.	1996
2.	Prasad.C., **Advanced Mathematics** For **Engineers** , Prasad Mudralaya.	1991
3.	Grewal,B.S., **Higher Engineering Mathematics**, Khanna Publishers.	2005
4.	Kreyszig, Erwin, Au., **Advanced Engineering Mathematics,** 8th Edition, John Wiley.	1999

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -02** Course Title: **Applied Linear Algebra**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To introduce Linear Algebra and its applications.

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**System of Linear Algebraic Equations:** Elementary row operations, row reduced echelon form, invertible matrices, applications.	3
2.	**Vector Spaces:** Vector space, subspace, sum of subspaces, linear independence, basis and dimensions, infinite dimensional spaces, coordinates.	3
3.	**Linear Transformations:** Definition, rank-nullity theorem, matrix representation, algebra of linear transformations, change of basis, solution of linear systems $AX = B$, applications to solution of differential equations.	7
4.	**Canonical Forms:** Eigen pairs, characteristic equation, eigen values and eigen vectors, properties, diagonalization , algebra of polynomials, polynomial ideal, minimal polynomial, Cayley-Hamilton theorem, generalized eigen vectors, Jordan form, computation of matrix exponential, solution to discrete and continuous dynamical systems, stability of linear system X=Ax.	16
5.	**Inner Product Spaces:** Cauchy Schwarz inequality, triangular inequality, orthogonal basis, Grahm-Schmidt process, projection operator, spaces L_2 and l_2, Fourier series and its applications to trigonometric Fourier series, heat and wave equation.	7
6.	**Special Matrices/Operators:** Hermitian, normal, unitary operators, Bilinear, quadratic and Hermitian forms. Positive definite operator and its applications to physical problems.	6
	Total	42

11. **Suggested Books:**

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Hoffman, K.& Kunze, R., **Linear Algebra**, Prentice Hall of India	2002
2.	Leon, S.J.,**Linear Algebra with Applications**,Prentice Hall of India	2005
3.	Peter J.Oliver and Shakivban .**Applied Linear Algebra** ,Prentice Hall.	2005
4.	Sudan,L .**Applied Linear Algebra**, Prentice Hall.	2001
5.	Strang G., **Linear Algebra and Its Applications**,3rd Edition,Thomson Asia Pvt..Ltd.	2003

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -03** Course Title: **Cryptography**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: The objective of this course is to serve as an introduction to cryptography and cryptanalysis.

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Mathematical Background:** Complexity theory, modular arithmetic, Chinese remainder theorem, finite fields , review of basic concepts of probability theory.	12
2.	**Symmetric-Key Encryption:** Introduction to stream ciphers, design of LFSR based stream ciphers, block ciphers, substitution-permutation networks (SPN), linear attack on SPN, Introduction to DES and AES.	10
3.	**Cryptographic Hash Functions:** Security of Hash functions, the random oracle model, Iterated hash functions, the Merkle Damgard construction, message authentication Codes (MAC), MIDI, probabilistic signatures	10
4.	**Public-Key Cryptography:** The RSA cryptosystem and factoring integers, attacks on RSA, digital signatures, the secure application of RSA encryption, Introduction to elliptic curve based cryptosystems.	10
	Total	42

11. **Suggested Books:**

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Douglas R. Stinson, **Cryptography Theory and Practice**. Chapman & Hall/ CRC.	2002
2.	Hans Delfs. Helmut Kenbl, **Introduction to Cryptography, Principles and Applications**. Springer.	2002
3.	Schneier B., **Applied Cryptography**, Wiley.	1996
4.	Stallings,W., **Cryptography and Network Security,** Pearson Education.	2005
5.	Koblitz,N., **A Course in Number Theory and Cryptography,** Springer International Ed.	1994

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -04** Course Title: **Discrete Mathematical Structures**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To introduce the fundamentals of discrete mathematics.

10. Details of Course:

S. No.	Particulars	Contact Hours
1.	**Relations and Functions:** Review of algebra of sets, relations, digraphs, matrix of a relation, properties of relations, equivalence and partial order relations, operations of relations, paths and closers, discrete numeric functions, growth of functions, big O and big Θ notations, hash functions.	10
2.	**Logic and Connectives:** Proposition, complex proposition, truth tables, tautologies, contradictions, arguments and proofs.	4
3.	**Recursion and Recurrence Relations:** Recursion, induction, iteration, recurrence relations and generating functions.	4
4.	**Boolean Algebra and Combinatorial Circuits:** Lattices, sublattices, isomorphism of lattices, boolean algebra, boolean expressions, application of boolean algebra to circuit theory, circuit minimization and simplification.	8
5.	**Monoids and Automata:** Definition and properties of monoids, isomorphism, free monoids, Grammars and their types, languages, finite state machines, equivalent finite state machines, monoid of a finite state machine and machine of a monoid.	8
6.	**Graph Theory:** Basic concepts, isomorphism and subgraphs, trees and their properties, spanning trees, directed trees, binary trees, planar graphs, Euler's formula, multigraphs and Euler circuits, Hamiltonian graphs.	8
	Total	42

11. Suggested Books:

S. No.	Name of Books / Authors	Year of Publication
1.	Liu C.L., **Elements of Discrete Mathematics**, Tata McGraw Hill.	2000
2.	Doerr, A. and Levasseur, K., **Applied Discrete Structure**, Galgotia Publication.	2004
3.	Kolman B., Busby R.C. and Ross S.C., **Discrete Mathematical Structures,** 5th edition, Pearson Education.	2005
4.	Johnsonbaugh, Richard ,**Discrete Mathematics** , 6th Edition, Maxwell Macmillan International Edition.	2006
5.	Joe. L. Mott, A. Kandel and Baker T. P.,**Discrete Mathematics for Computer Scientists & Mathematician** , Prentice Hall of India Pvt. Ltd.	2001

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -06** Course Title: **Finite Element Methods**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To provide basic aspect of finite element technique and its applications.

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Introduction of Finite Element Methods and Basic Concepts:** Introduction, basic differences between finite element and finite difference methods.	4
2.	**Method of Weighted Residuals** : Collocation, method of least squares and Galerkin's method, numerical solution of ordinary and partial differential equations using these methods, elements of calculus of variations, equivalence of Galerkin and Ritz method in some cases.	8
3.	**Variational Formulation of Boundary Value Problems**	4
4.	**Types of Elements in One Dimension and Assembly:** Linear, quadratic and higher order elements, assembly, solution of banded system and numerical integration, application to O.D.E.	8
5.	**Types of Elements in Two Dimensions and Assembly:** Elements in two and three dimensions, linear and quadratic triangular elements rectangular elements, bilinear elements serendipity elements, curved boundaries, isoperimetric elements and their assembly, some programming aspects-mesh generation, element equations, assembly of equations, solution of equations.	12
6.	**Applications to Some Engineering Problems.**	6
	Total	42

11. **Suggested Books:**

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Reddy, J. N ., **An Introduction to Finite Element Methods**, McGraw Hill,	2007
2.	Rao, S. S, **The Finite Element Methods in Engineering**, 4th edition, Butterworth Heinemann.	2004
3.	Bathe, K.J.,**Finite Element Procedures,** Prentice Hall.	2003

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -07** Course Title: **Fuzzy Set Theory and its Application**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To introduce concepts of fuzzy set theory and its applications in some areas.

10. Details of the Course:

S. No.	Particulars	Contact Hours
1.	**Fuzzy Sets :** Concepts of crispness and fuzziness, crisp sets and fuzzy sets, α - cuts, convex fuzzy sets, operations on fuzzy sets, type – 2 fuzzy sets, fuzzy numbers and extended operations on them, LR – representations of fuzzy sets and extended operations on them, t – norms and t – conorms, increasing and decreasing generators, interval equations, fuzzy equations.	17
2.	**Fuzzy Relations & Fuzzy Graphs:** Fuzzy relations on fuzzy sets, composition of fuzzy relations, fuzzy graphs.	5
3.	**Fuzzy Analysis:** Fuzzy functions and their extrema, integration of fuzzy functions, fuzzy differentiation.	5
4.	**Fuzzy Logic & Approximate Reasoning:** Fuzzy measures and measures of fuzziness, linguistic variables, fuzzy logic, truth tables, approximate reasoning in support logic programming.	5
5.	**Expert Systems and Fuzzy Control:** Expert systems, uncertainty modeling in expert systems, fuzzy control, process of fuzzy control.	5
6.	**Decision Making in Fuzzy Environments:** Fuzzy decisions, fuzzy linear programming problems, fuzzy transportation problems, fuzzy dynamic Programming, fuzzy multi-criteria analysis.	5
	Total	42

11. **Suggested Books:**

S. No.	Name of Books/ Authors/ Publisher	Year of Publication
1.	Zimmermann, H.J., **Fuzzy Set Theory and its Applications**, Allied Publishers Limited.	1996
2.	Klir, George J. and Folger, Tina A., **Fuzzy Sets, Uncertainty and Information**, Prentice Hall of India, Pvt. Ltd.	2003
3.	Klir, George J. and Bo Yuan, **Fuzzy Sets and Fuzzy Logic: Theory and Applications**, Prentice Hall of India, Pvt. Ltd.	2003
4.	Ross, T.J., **Fuzzy Logic with Engineering Applications**, 2nd Edition, John Wiley & Sons Ltd.	2005
5.	Lai, Y and Hwang, C., **Fuzzy Mathematical Programming**, Springer – Verlag.	1992

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics**

1. Subject Code: **IMA -08** Course Title: **Graph Theory**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**
9. Objective: To acquaint the students with the basic concepts of graph theory.
10. Details of Course:

S. No.	Particulars	Contact Hours
1.	**Introduction to Graphs:** Definition of a graph, finite and infinite graphs, incidence and types of vertices, sub graphs, isomorphism between two graphs, connectivity, traversability, Eulerian and Hamiltonian graphs, traveling salesman problem .	8
2.	**Trees and Fundamental Circuits:** Definition and properties of trees, rooted and binary trees, counting trees, spanning trees in a graph, fundamental circuits, cut sets, separability, network flows.	8
3.	**Vector Spaces Associated with Graphs:** Galois fields, vector spaces associated with graphs, orthogonal vectors and spaces.	4
4.	**Matrix Representation of Graphs:** Different types of matrices corresponding to a graph, incidence, circuits, cut-set, path and adjacency matrices of a graph.	6
5.	**Planar and Colorings:** Planar graphs, Kuratowski's graphs, detections of planarity, chromatic number, chromatic polynomial, chromatic partitioning, covering and four color problem, geometric dual, combinatorial dual.	5
6.	**Directed Graphs:** Types of digraphs, digraphs and binary relations, directed paths and connectedness, Euler digraphs, adjacency graphs, pair comparison and tournaments.	5
7.	**Enumeration & Polyas's Enumeration Theory:** Types of enumerations, Polya's counting theorem and its applications.	6
	Total	42

11. Suggested Books:

S. No.	Name of Books / Authors	Year of Publication
1.	Deo Narsingh; **Graph Theory with Applications to Engineering and Computer Science**, Prentice Hall of India.	2004
2.	Clark John and Holton D.A., **A First Look At Graph Theory**, Allied Publishers Ltd.	1995
3.	West Denglas B., **Introduction to Graph Theory**, Pearson Education.	2002
4.	Mott J.L., Kandel A, and Baker T.P., **Discrete Mathematics for Computer Scientists and Mathematicians**, Prentice Hall of India.	2001
5.	Reinhard ,Diestel, **Graph Theory**, Springer International Edition.	2004
6.	Aldous J.M , Wilson R.J.,**Graphs and Applications: An Introductory Approach** ,Springer-Verlag.	2007

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA -09** Course Title:**Mathematical Control Theory**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To impart the knowledge of the fundamentals of mathematical control theory.

10. **Details of the Course:**

S. No.	Particulars	Contact Hours
1.	**Introduction:** Simple mathematical model of control system representing real life problems.	2
2.	**Control System** : State space representation of a dynamical system, solution of linear time invariant system, computation of transition matrix and the solution of dynamical system, controllability and observability of linear control system, duality theorems, computation of control, examples.	15
3.	**Feedback Control**: State feedback of a control system, controllability and feedback, eigen value assignment.	8
4.	**Stability Analysis**: Stability of linear system, relation between eigenvalues and stability, asymptotic stability, Routh – Hurwitz criterion, Lyapnov function and stability, Nyquist stability criterion, examples.	10
5.	**Optimal Control**: Optimal control criteria for linear control system, computation of optimal control for some simple control systems.	7
	Total	42

11. Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Nagrath I.J.,Gopal M. ,**Control System Engineering** , 3rd Edition, New Age International.	2001
2.	Datta Biswa Nath, **Numerical Methods for Linear Control Systems**, Academic Press Elsevier.	2005
3.	Benjamin C. Kuo,**Automatic Control System**, Prentice Hall.	2001

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-10** Course Title: **Modeling with Difference & Differential Equations**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To provide mathematical moceling techniques for solving real life problems.

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Introduction to Mathematical Modeling** General features of modeling, types of models, framework of modeling with a simple case study.	2
2.	**First order Differential Equations**: Rocket flight, Torricelli's law for water flow, Inhibited growth model, spread of epidemics, electric circuits, economic growth, growth and decay equation, application to drug absorption, carbon dating, water heating and cooling.	14
3.	**Second Order Linear Differential Equations**: Mechanical oscillations, electric circuits.	6
4.	**System of Linear and Non-linear Differential Equations**: Spring mass system, interacting species, drug kinetics, planetary motion.	10
5.	**Difference Equations:** Growth models with delay, economic models.	6
6.	**Partial Differential Equations**: Traffic control models, biological systems.	4
	Total	42

11. Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Kapur, J.N., **Mathematical Models in Biology & Medicine,** East West Press Ltd.	1992
2.	Kapur ,J.N., **Mathematical Modeling,** Wiley Eastern Ltd.	1995
3.	Barnes,B., Fulford, G.R. **Mathematical Modeling with Case Studies,** Taylor & Francis,	2002
4.	Mazumdar,J.N., **Biofluid Mechanics,** Word Scientific.	1997
5.	Dym, Clive L., Au., **Principles of Mathematical Modeling,** Elsevier.	2006

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-11** Course Title: **Numerical Methods**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9. Objective of the Course: To impart the knowledge of basic numerical techniques for solving a variety of problems .

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	***Error Analysis***: Types of errors, propagation of errors, correct and significant digits.	3
2.	**Solution of System of Linear Equations**: Gauss elimination method with partial pivoting, L-U decomposition method: Doolittle and Crout's methods Jacobi and Gauss – Seidel iterative methods.	5
3.	**Eigen Values and Eigen Vectors**: Dominant and smallest eigen values and eigen vectors by power method.	3
4.	**Roots of Non-linear Equations** : Bisection, regula-falsi, Atkin's, Newton – Raphson methods, direct iterative method with convergence criteria, Newton – Raphson methods to the solution of non-linear equations.	6
5.	**Interpolation**: Finite difference operators, difference table and interpolation formulae - Newton's forward, backward, Stirling's and Bessel's formulae. Newton's divided difference and Lagrange's interpolation formulae, errors in various interpolation formulae, cubic spline interpolation, Inverse interpolation-successive approximation and Lagrange's method.	8

6.	**Numerical Differentiation & Integration** : Various formulae for first and second order derivatives. trapezoidal, simpson's 1/3 and 3/8 rules, Romberg integration and Gaussian quadrature formulae.	6
7.	**Solution of Ordinary Differential Equations** : Picard , Euler, modified – Euler, fourth –order Runge-Kutta methods, Milne's predictor – corrector method, errors.	7
8.	**Solution of Parabolic Partial Differential Equations** : Explicit & Crank – Nicolson methods and their convergence.	4
	Total	42

11.Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Gerald,Curtis F. and Wheatley, Patrick O .,**Applied Numerical Analysis**, 6th Edition, Addison Wesley.	2002
2.	Jain M.K,Iyengar,S.R.K. & Jain, R. K.,**Numerical Methods for Scientific and Engineering Computation**, 3rd Edition, New Age Int. Pvt. Ltd. Pub.	2000
3.	Conte, S.D. & De Boor C., **Elementary Numerical Analysis**, 3rd Edition, Tata McGraw Hill.	2005
4.	Smith, G. D., **Numerical Solution of Partial Differential Equations**, Oxford University Press.	1986

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-12** Course Title: **Operations Research**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9.Objective of the Course: To expose the students to some operations research models and their solution techniques.

10.Details of the Course:

S.No.	Particulars	Contact Hours
1.	**OR Models :** Different types of OR models and their constructions.	2
2.	**Linear Programming Problems:** Convex sets, graphical method, simplex method, artificial variables methods, duality theory, dual simplex method, sensitivity analysis.	15
3.	**Integer Linear Programming Problems:** Cutting plane method, branch and bound technique for all integer and mixed integer programming problems.	3
4.	**Transportation Problems:** Transportation and assignment problems.	5
5.	**Game Theory:** Rectangular games, minimax theorem, graphical solution of 2 x n and m x 2 games, reduction to linear programming problem.	5
6.	**Sequencing and Inventory Models:** Processing of jobs through machines, inventory models.	7
7.	**Queueing Models :** Analysis of simple queues with poisson arrival and exponential service time distributions.	5
	Total	42

11. Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Hiller F.S. and Leibermann G.J.,**Introduction to Operations Research**, 7th Edition ,Tata McGraw Hill.	2002
2.	Taha,H.A., **Operations Research – An Introduction** , 6th Edition ,Prentice Hall.	2001
3.	Ravindran A., Philips D.T. and Solberg J.J.,**Operations Research: Principles and Practice.** 2nd Edition ,John Wiley & Songs.	2001
4.	Pant, J.C., **Introduction to Optimization Techniques,** 5th Edition, Jain Brothers.	2000
5.	Rao,S.S., **Engineering Optimization: Theory & Practice** , 3rd Edition, New Age Int.	1996

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-13** Course Title: **Optimization Techniques**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 3 **Practical** 0

4. Relative Weightage: **CWS** 15 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: Nil
(The students having studied the course on Operations Research are not eligible to offer this course)

9.Objective of the Course: To introduce the students to the subject of optimization techniques.

10.Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Formulation:** Mathematical formulation of optimization problems.	2
2.	**Linear Programming Problems:** Convex sets, graphical method, Simplex method, artificial variable methods, duality theory, dual simplex method, integer programming problems.	15
3.	**Non-linear Programming Problems:** Convex functions, Kuhn-Tucker theory, quadratic problems, Wolfe's and complementary pivot algorithms.	7
4.	**Geometric Programming Problems:** Problems with positive coefficients upto two degrees of difficulty.	5
5.	**Dynamic Programming :** Bellman's principle of optimality and method of recursive optimization (problems involving one constraint).	5
6.	**Search Techniques:** Unimodal functions, direct search and gradient methods, fibonacci method, golden section method, steepest decent method, Newton-Raphson method, Hooke's and Jeeve's method, conjugate gradient methods.	8
	Total	42

11.Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Hiller F.S. and Leibermann G.J.,**Introduction to Operations Research**, 7th Edition ,Tata McGraw Hill.	2002
2.	Taha,H.A..**Operations Research – An Introduction** , 6th Edition ,Prentice Hall.	2001
3.	Ravindran A., Philips D.T. and Solberg J.J..**Operations Research: Principles and Practice**, 2nd Edition ,John Wiley & Songs.	2000
4.	Pant, J.C., **Introduction to optimization techniques,** 5th Edition, Jain Brothers.	2000
5.	Rao, S.S., **Engineering optimization: Theory & Practice** , 3rd Edition, New Age Int.	1996

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Mathematics Department**

1. Subject Code: **IMA-15** Course Title: **Robotics & Control**

2. Contact Hours: L: 3 T: 0 P: 0

3. Examination Duration (Hrs.): Theory 3 Practical 0

4. Relative Weightage: CWS 15 PRS 0 MTE 35 ETE 50 PRE 0

5. Credits: 3 6. Semester: **Both** 7. Subject Area: **BGSEC**

8. Pre-requisite: **Nil**

9.Objective of the Course: To impart the knowledge of basic principles of robot manipulators and their control.

10. Details of the Course:

S.No.	Particulars	Contact Hours
1.	**Introduction**: Robotics, Robot manipulators, simple two / three degrees of freedom model.	4
2.	**Homogeneous Transformation**: Co-ordinate frames, translation and rotation, change of frames, homogeneous transformation, composite homogeneous transformations, general axis of rotation.	6
3.	**Kinematics** : Link coordinate frames, kinematics parameters, the D-H representation, Arm equation.	10
4.	**Inverse Kinematics**: The inverse kinematics problem, tool configuration, Solution of inverse kinematics problem with examples, trajectory planning and work space analysis.	10
5.	**Differential Relationships**: Derivative of homogeneous transformation, velocity and acceleration of end-effector, manipulator, jacobian, dynamical equations, control of manipulator dynamics, robotic vision and control.	12
	Total	42

11. Suggested Books:

S.No.	Name of Books / Authors / Publisher	Year of Publication
1.	Yoshikawa, Tsuneo, Au., **Foundations of Robotics Analysis & Control**, Prentice hall.	1990
2.	Schilling, Robert J., **Fundamentals of Robotics: Analysis and Control**. Prentice Hall of India.	2005
3.	Ghosal, Ashitava, **Robotics: Fundamental Concepts and Analysis**, Oxford University Press.	2006
4.	Craig, John J., **Introduction to Robotics Mechanics and Control**, Pearson Education.	2004

Appendix 'B'
Senate/25.2.2

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: PH-01 Course Title: **Quantum Devices**

2. Contact Hours: L: 3 ; T: 0 ; P: 0 ;

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: CWS 15 PRS 00 MTE 35 ETE 50 PRE 00

5. Credits: 03 6. Semester: ✓ Autumn | Spring | Both

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To familiarize students with an understanding of how the electronic, optical and transport properties of quantum wells, wires and dots are calculated.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	Basics of quantum mechanics, probability and the uncertainty principle, the Schroedinger wave equation, potential well problem, tunneling, particles in periodic potentials, energy bands, transport in quantum structures (perpendicular and parallel)	14
2.	Electronic quantum devices, field effect transistor, hetrostructure field effect transistor, bipolar hetrostructure transistors, resonant tunneling oscillators, diodes and transistors, multi peak current voltage characteristics and multi valued logic applications.	12
3.	Optical quantum devices, optics of quantum structure, optical resonators, interaction of light with matter, optical properties of bulk semiconductors, optical properties of quantum structures, intra-band transitions, light amplification in semiconductors, light emitting diodes, amplification feedback and laser oscillations, modulation of laser output, quantum well lasers, surface emitting lasers, blue quantum well lasers, photoconductive detectors.	16
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Milin V.V., Kochelap V.A. and Strescio M.A., "**Quantum Hetrostructures**", Cambridge University Press.	1999
2.	Sze S.M., "**Physics of Semiconductor Devices**", 2nd edition, Wiley Eastern Ltd.	1991
3.	Roy D.K., "**Physics of Semiconductor Devices**", Hyderabad University-Press, India	1992
4.	Harrison P, "**Quantum Wells, Wires and Dots**", 2nd Ed., John Wiley and Sons .	2005

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-02** Course Title: **Nanomaterials**

2. Contact Hours: L: 3 T: 0 P: 0

3. Examination Duration (Hrs.): Theory 0 | 3 Practical 0 | 0

4. Relative Weightage: **CWS** 1 | 5 **PRS** 0 | 0 **MTE** 3 | 5 **ETE** 5 | 0 **PRE** 0 | 0

5. Credits: 0 | 3 6. Semester: Autumn [ ] Spring [✓] Both [ ]

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To introduce the emerging area of nanotechnology which has potential to revolutionize techniques by which materials and products will be created in the future with new and superior properties and functionalities.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Introduction:** Definitions and course organization, classification of functional nanomaterials, historical development.	02
2.	**Fundamental Principles:** Size & scale, units, scaling Laws, atoms, molecules & clusters, supramolecules, nanoscale phenomena, Tunneling, Chemical Bonds (types and strength); Intermolecular forces, molecular and crystalline structures; Hierarchical structures and functionality; Surfaces and interfaces, bulk to surface transition, self-assembly and surface reconstruction.	08
3.	**Properties of Nano Materials:** Size dependence of properties, phenomena and properties at nanoscale; Mechanical/frictional, optical, electrical transport; Magnetic properties.	09
4.	**Nanomaterial Characterization:** Electron microscopy, scanning probe microscopies, near field microscopy, micro- and near field Raman spectroscopy, surface-enhanced Raman, spectroscopy, X-ray photoelectron spectroscopy.	10
5.	**Synthesis of Nanomaterials:** Fabrication techniques: Self-assembly, self-replication, sol-gels, Langmuir-Blodgett thin films, nanolithograph, bio-inspired syntheses, microfluidic processes; Chemical vapor deposition: Semiconductors, cadmium sulfide, silicon, fullerenes carbon nanotubes; Nano-composites, nanoporous materials, biological materials.	10
6.	**Applications of Nanomaterials:** Nanoelectronics, nanosensors, environmental, biological, energy storage and fuel cells.	03
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Edelstein A. A. and Cammarata R .C., "**Nanomaterials- Synthesis, Properties and Applications**", Institute of Physics Publishing.	1998
2.	Nalwa H.S., "**Handbook of Nanostructured Materials and Nanotechnology**", Vols. 1-5, Academic Press	2000
3.	Benodek et al G., "**Nanostructured Carbon for Advanced Applications**", Kluwer Academic Publishers	2001
4.	Dresselhaus M.S., Dresselhaus G. and Eklund P., "**Science of Fullerenes and Nanotubes**", Academic Press	1996

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-03** Course Title: **Fiber Optics**

2. Contact Hours: L: 3 T: 0 P: 0

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: **CWS** 5 **PRS** 0 **MTE** 35 **ETE** 50 **PRE** 0

5. Credits: 3 6. Semester: Autumn ( ) Spring (✓) Both ( )

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To provide an understanding of the physical principles of optical fibers and the engineering aspects of their use in optical telecommunication systems and sensor technology.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Basic Characteristics of the Optical Fiber:** Light guidance, numerical aperture, coherent bundle, attenuation, pulse dispersion, loss mechanisms.	02
2.	**Pulse Dispersion in Optical Waveguides:** Ray paths, transit time calculations, parabolic index medium, step-index planar waveguide, power law profile, pulse dispersion in graded index optical fibers, material dispersion, group velocity, pulse broadening.	04
3.	**Electromagnetic Analysis of Planar Waveguides and Optical Fibers:** TE and TM guided modes of a planar waveguide, power associated with a mode, radiation modes, modal analysis of a step-index fiber, fractional modal power in the core, Gaussian approximation, splice loss Petermann-2 spot size the far- field pattern.	12
4.	**Sources and Detectors for Optical Fiber Communication:** Laser diode characteristics, LED characteristics, PIN photodetector, avalanche photodiode.	04
5.	**Design Considerations for a Fiber Optic Communication System:** Group delay and waveguide dispersion, empirical formula for step-index fibers, dispersion-shifted fibers, single-mode operation, splice loss, bending loss, analog and digital modulation, signal to noise ratio, bit error rate, power budgeting, rise time budgeting, attenuation limited system, dispersion limited system.	07
6.	**Fiber-Optic Components and Sensors:** Optical fiber amplifier, dispersion compensating fiber, optical fiber directional coupler, polarization controller, fiber Bragg gratings, long period fiber gratings, fiber optic interferometric sensors, current sensors, gyroscope, pH-sensor, gas sensors, temperature, strain and pressure sensors, liquid level sensor, displacement sensor, civil structure monitoring, smart structure.	10
7.	**Fiber Fabrication:** Fabrication techniques, outside vapour-phase oxidation, vapour-phase axial deposition, modified chemical vapour depositions, plasma-activated chemical vapour deposition, double-crucible method, mechanical properties of fibers, fiber-optic cables.	03
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Keiser G., "**Optical Fiber Communications**", McGraw Hill, New York.	2000
2.	Ghatak A. and Thyagarajan K., "**Introduction to Fiber Optics**", Cambridge University Press.	1998
3.	Agrawal G. P., "**Fiber-optic Communication Systems**", John Wiley Singapore.	2002
4.	Dresselhaus M.S., Dresselhaus G. and Eklund P., "**Science of Fullerenes and Nanotubes**", Academic Press.	1991
5.	Dakin J. and Culshaw B., "**Optical Fiber Sensors**", Boston – Artech House.	1997

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-04** Course Title: **Space Science and Technology**

2. Contact Hours: L: 3 ; T: 0 ; P: 0 ;

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: CWS 15 PRS 00 MTE 35 ETE 50 PRE 00

5. Credits: 03 6. Semester: Autumn ✓ Spring Both

7. Pre requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** The course aims to familiarize students with the basics of space science and technology and it's applications.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Earth and Orbiting Satellites:** Basic principles, Keplerian orbits and Kepler equations, orbital elements, from velocity and position information; Perturbation theory and applications, data receiving and handling.	08
2.	**Rockets and Rocket Propulsion:** Rockets and rocket propulsion, liquid fuels, solid fuels, electromagnetic propulsion, ion propulsion, important satellite launching stations, facilities at ISRO, NASA and ESRO Russian and Chinese facilities.	08
3.	**Global Positioning Systems:** Global navigation satellite systems, GPS signal structure, Application of GPS systems.	06
4.	**Satellite Communications:** Earth to satellite communication, laser communication, satellite to satellite communication.	06
5.	**Applications of Space Technology:** Physics of the earth's atmosphere, Solar observations in infrared, visible and X-rays; Communication satellite and applications; Earth resource monitoring, remote sensing and others, Hubble space telescope, military applications, weather satellite and applications.	10
6.	**Manned Flights:** Manned flights to moon, Manned orbiting space crafts, NASA space shuttles; Immunity and infection in space; The International space station and application; Russian space crafts, Skylab.	04
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Mark Hans, "**Space Science and Technology**", John Wiley and Sons.	2003
2.	Verger E T, "**The Cambridge Enclyopedia of Space, Missions, Applications and Exploration**", Cambridge University Press.	2003
3.	Uberoi C. and Chakravorty S.C., "**Space Environment and it's Interaction With Spacecraft**", IISc - ISRO Educational Program.	2000
4.	Hans Mark., Silveira, Yarymovych Michael I Million., "**Encyclopedia of Space Science and Technology**", Hoboken, Wiley Interscience.	2003
5.	Garner, John T., Gones, Macolam, "**Satellite Operations, Systems Approach to Design and Control**", Ellis Horwood.	1990
6.	Kaula, William M, "**Theory of Satellite Geodesy Applications of Satellite Geodesy**", Mineola Dover Publications.	2000

7.	El-Rabbany, Ahmed, "**Introduction to GPS The Global Positioning System**", Artech House.	2002
8.	Kaplan, Elliott D., "**Understanding GPS: Principles and Applications**", Artech House.	1996
9.	Xu, Guochang, "**GPS: Theory, Algorithms and Applications**", Springer.	2003

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-05** Course Title: **Superconducting Materials & Devices**

2. Contact Hours: L: 3 ; T: 0 ; P; 0 ;

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: **CWS** 1 5 **PRS** 0 0 **MTE** 3 5 **ETE** 5 0 **PRE** 0 0

5. Credits: 0 3 6. Semester: Autumn | Spring | ✓ Both

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To provide comprehensive knowledge on superconductivity and superconducting materials.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Characteristic Properties of Superconducting Materials and Basic Theories:** Zero resistance, Meissner effect, critical magnetic field, critical current density; Type-I and Type-II superconductors, isotope effect, flux quantization, thermal properties of superconductors; Heat capacity, thermal conductivity, energy gap, London's equations, outline of Ginzberg Landau theory, outline of BCS theory.	8
2.	**Superconducting Materials:** Superconducting elements, Binary alloys and compounds, Organic superconductors, High-T_c cuprate superconductors, C_{60} based superconductors.	5
3.	**Processing and Characterization of High T_c Materials:** Familiarization with various techniques of synthesis of HTSC phase of cuprate superconductors in bulk, thin films, single crystals and tape/wires forms; Familiarization with various techniques of electrical, magnetic and structural characterizations of HTSC materials.	10
4.	**Critical Current of Type-II Superconductors:** Mixed state, stable and metastable states, the Abrikosov lattice, flux flow, flux pinning, flux creep, irreversible properties, depairing critical current, hysteresis cycle: the Bean model, Effects of grain boundaries on J_c in high-T_c superconductors.	8
5.	**Josephson Effects:** The tunnel effect: NIN, NIS and SIS junctions, dc Josephson effect, ac Josephson effect, dc and rf SQUIDS.	6
6	**Technology and Applications:** Large scale and high current applications of superconductors, superconducting electronics and film applications.	5
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Kittel C., "**Introduction to Solid State Physics**" John Willey	1956
2.	Rose-Innes A. C. and Rhoderick E. H., "**Introduction to Superconductivity**", Pergamon Press.	1969
3.	Ramakrishnan T.V. and Rao C.N.R., "**Superconductivity Today**", Pergamon Press	1992
4.	Michel C. and Davor P., "**Introduction to Superconductivity and High Tc Materials**", World Scientific.	1992
5.	Burns G., "**High Temperature Superconductivity — An Introduction**", Academic Press	1991
6.	Kresin V.Z. and Wolf S.A., "**Fundamentals of Superconductivity**", Plenum Press.	1990
7.	Tinkham M., "**Introduction to Superconductivity**", Dover Publications.	2004

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-06** Course Title: **Applied Quantum Physics**

2. Contact Hours: L: 3 ; T: 0 ; P: 0 :

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: **CWS** 15 **PRS** 00 **MTE** 35 **ETE** 50 **PRE** 00

5. Credits: 03 6. Semester: Autumn [ ] Spring [ ] Both [✓]

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To provide comprehensive knowledge of quantum mechanics and its applications to semiconductors.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Introduction:** Wave-particle duality of matter and radiations, wave-packets, uncertainty principle, wave function, operator and their expectation values, Schrodinger wave equation.	8
2.	**One-Dimensional Problems:** Wave function of a particle in 1-D space, potential-step & potential barrier problems, finite potential well and bound states, one-dimensional harmonic oscillator, particle in a one-dimensional periodic potential, Kronig-Penny model.	8
3.	**Two and Three Dimensional Problems:** Particle in a 3-D potential box, particle is a 3-D periodic potential, bands and band gaps in solids, wave function of electrons in solics, Bloch theorem.	8
4.	**Semiconductor Physics:** Energy bands in semiconductors, electrons and holes, effective mass of electrons and holes, mobility of charge carriers in field, carrier lifetime, direct and indirect recombination of electrons & holes, metal-semiconductors contacts, Quantum well and superlatices.	10
5.	**Semiconductor Lasers:** Spontaneous and stimulated emission in semiconductors, p-n junction lasers, semiconductor heterojunction lasers.	8
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Levi A.F.J., "**Applied Quantum Mechanics**", Cambridge Univ. Press.	2005
2.	Eisberg Robert & Resnick Robert, "**Quantum Physics**", John Wiley.	2004
3.	Thomas Fromhold Jr. Albert, "**Quantum Mechanics for Applied Physics & Engg.**", Academic Press.	1981
4.	Singh J., "**Semiconductor Devices**", John Wiley.	2004

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-07** Course Title: **Reactor Physics**

2. Contact Hours: L: 3 ; T: 0 ; P: 0 ;

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: **CWS** 1 5 **PRS** 0 0 **MTE** 3 5 **ETE** 5 0 **PRE** 0 0

5. Credits: 0 3 6. Semester: Autumn ( ) Spring ( ) Both (✓)

7. Pre-requisite: PH-101 8. Subject Area: BGSEC

9. **Objective of Course:** To provide comprehensive knowledge on nuclear reactor physics and its technological aspects.

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	**Nuclear Physics:** Fundamental particles, structure of nuclei; Binding energy, nuclear stability and radioactive decay, nuclear reactions.	6
2.	**Interaction Radiation with Matter:** Neutron interactions, energy loss in scattering collisions, fission, Gamma-ray interactions with matter, charged particles.	6
3.	**Nuclear Reactors and Nuclear Power:** Fission chain reactions, reactor fuels, nuclear power resources, power plants, nuclear reactors.	6
4.	**Neutron Diffusion and Moderation:** Neutron flux, diffusion equation and its solution, thermal neutron diffusion.	6
5.	**Nuclear Reactor Theory:** one-group reactor equation, slab reactor, thermal reactor, reflected reactor.	6
6.	**Time-Dependent Reactor:** Reactor kinetics, temperature effects on reactivity, fission product poisoning.	6
7.	**Heat Removal from Nuclear Reactors:** Heat generation in reactors, heat flow in reactors, heat transfer mechanisms. **Radiation Shielding:** Gamma-Ray shielding, nuclear reactor shielding.	6
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	LeRoy Murray Raymond, "**Nuclear Reactor Physics**", Prentice Hall	2000
2.	R. Lamarsh John, J. Baratta Anthony, "**Introduction to Nuclear Engineering**", Wiley-Interscience.	2002

Appendix 'C'

Senate/25.2.5

Proposed Teaching Scheme for M. Tech. in Nanotechnology

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			**1st Semester (Autumn)**											
1.	MA- 501B	Advanced Mathematics	PG- 11	4	3	1	-	3	-	25	-	25	50	-
2.	NT- 501	Nanoscale Materials	PG- 13	4	3	1	-	3	-	25	-	25	50	-
3.	NT- 511	Nanoscale Modeling and	PG- 12	4	3	1	-	3	-	25	-	25	50	-
4.	MT- 507	Simulation	PG- 13	4	3	0	2	3	-	15	15	30	40	-
5.		Advanced Metallographic	PG- 14	-										
6.		Techniques	PG-15	-										
		Major Elective												
		Minor Elective												
		Sub total		**23 - 24**										
1st Year			**2nd Semester (Spring)**											
1		Major Elective	PG-14	-										
2		Major Elective	PG-14	-										
3		Major Elective	PG-14	-										
4		Major Elective	PG-14	-										
5		Major Elective	PG-14	-										
6		Minor Elective	PG-15	-										
		Sub total		**23 - 24**										
2nd Year		**III Semester (Autumn)**												
1.	NT- 601	Seminar	PG- 18	4										
2.	NT - 602	Project	PG- 19	8										
3.	NT - 603	Dissertation	PG- 20	-										
		Sub total		**12**										
2nd Year		**IV Semester (Spring)**												
1.	NT - 603	Dissertation	PG- 20	32										
		Sub total		**32**										
		Total		**91-92**										
Major Electives														
1.	MT- 511	Transport Phenomena	PG- 14	4										
2.	NT- 502	Structural Analysis of Nanomaterials	PG- 14	4										
3.	NT-512	Technology of Nanostructrued Fabrications	PG- 14	4										
4.	CY- 621	Molecular Spectroscopy	PG- 14	4										
5.	CY- 731	Characterization of Materials	PG- 14	4										
6.	NT- 522	Mechanical Behavior of Nano and Amorphous Materials	PG- 14	4										
7.	NT- 532	Supramolecualr Chemistry of Nanomaterials	PG- 14	4										
8.	NT- 542	Nanobiotechnology	PG- 14	4										
9.	PH- 772	Nanomaterials & Technology	PG- 14	4										
10	NT- 552	Physics of Nanomaterials	PG- 14	4										
11	MT- 503	Advanced metallurgical Thermodynamics & Kinetics	PG-14	4										

Proposed Structure of M.Tech. (Nanotechnology)

S.No.	Name of the Course	Credits	Remarks if any
1.	MA –501B Advanced Mathematics	4	
2	NT-501 Nanoscale Materials	4	
3.	NT-511 Nanoscale Modeling and Simulation	4	
4.	MT – 507 Advanced Metallographic Techniques	4	
5.	**Major Electives (Departmental):** ***Group 1 -*** (i). NT-502 Structural Analysis of Nanomaterials (ii). CY- 621 Molecular Spectroscopy (iii). NT-522 Mechanical Behavior of Nano and Amorphous Materials (iv). NT-532 Supramolecular Chemistry of Nanomaterials (v). NT- 542 Nanobiotechnology (vi). NT- 552 Physics of Nanomaterials ***Group 2 -*** (i). MT-511 Transport Phenomena (ii). NT-512 Technology of Nanostructrued Fabrications (iii) CY- 731 Characterization of Materials (iv). PH-772 Nanomaterials & Technology (v). MT-503 Advanced Metallurgical Thermodynamics & Kinetics (vi) EC – 642 RF and Microwave MEMS	***23-24 Cr*** 4 4 4 4 4 4 4 4 4 4 4 3	Six courses to be opted with the advice of Faculty Advisor **(At least <u>Two</u> electives have to be opted from each group)**
6.	**Minor Electives – Interdepartmental**	***8 Cr***	To be opted with the advice of Faculty Advisor
7.	**NT-601 Seminar**	4	
8.	**NT-602 Project**	8	
9.	**NT-603 Dissertation**	32	
	Total	**91-92**	

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE Centre of Nanotechnology

1. Subject Code: **NT - 501** Course Title: **Nanoscale Materials**

2. Contact Hours: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: **03** Practicals: **00**

4. Relative weightage: CWS: **25** PRS: **00** MTE: **25** ETE: **50**

5. Credits: **04**

6. Semester: **Autumn**

7. Pre-requisite: None

8. Subject Area: PG-13

9. Objectives: This course is aimed at providing various concepts of nanosized materials, their preparation, properties and applications.

10. **Details of Course**:

S.No.	Particulars	Contact Hours
1	***Historical Perspective -*** An overview of natural and classical nanosystems.	**2**
2	***Classification and Nomenclature of Nanomaterials*** – Nanosized metals and alloys, semiconductors, ceramics - a comparison with respective bulk materials; organic semiconductors, carbon nanotubes, nanorods, nanocomposites consisting of organic, inorganic and biomaterials; zero-, one-, two-, and three dimensional nanostructures – quantum dots, quantum wells, quantum rods, quantum wires, quantum rings.	**5**
3	***Novel Properties of Nanomaterials*** – Size and shape dependent optical, emission, electronic, transport, photonic, refractive index, dielectric, mechanical, magnetic, non-linear optical properties; catalytic and photocatalytic properties.	**9**
4	***Synthesis of Nanoparticulates -*** Nucleation and growth of nanosystems, Physical methods – mechanical milling, laser ablation, sputtering, microwave plasma etc.; Chemical methods – chemical reduction and oxidation, sol-gel processes,	**12**

	photolysis, radiolysis, metalloorganic chemical vapor deposition; designing of advanced integrated nanocomposites, functional nanomaterials and nanostructured thin films.	
5	***Theories of Nanosized Materials* –** Transition metal sols, origin of plasmon band, Mie theory, influence of various factors on the plasmon absorption, quantum confinement in semiconductors – particle in a box like model for quantum dots, origin of charge on colloidal sols and its implications in making building blocks.	**9**
6	***Applications and Perspectives of Nanomaterials* -** Development of nanoscale catalysts, photocatalysts, sensitizers, sensors, composites, polymers, ceramics, biomaterials, pharmaceuticals, optical, fluorescent, electronic, magnetic and photonic devices, future perspectives of nanotechnology in miniaturization of devices and fabrication of value added products.	**5**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of Books/Authors	Year of Publication
1	KJ Klabunde, Ed., Nanoscale Materials in Chemistry, John Wiley & Sons Inc., New York.	2001
2	CP Poole, FJ Owens, Eds., Introduction to Nanotechnology, John Wiley & Sons Inc., New Jersey.	2003
3	HS Nalwa, Ed., Encyclopedia of Nanoscience and Nanotechnology.	2004
4	LV Interante, MJ Hampden- Smith, Eds., Chemistry of Advanced Materials – An Overview, Wiley VCH.	1998
5	G Schmid, Ed., Nanoparticles, Wiley-VCH Verlag GmbH & Co. KgaA, Weinheim, Germany.	2004
6	V Rotello, Ed., Nanoparticles - Building Block for Nanotechnology, Kluwer Academic/Plenum Publishers, New York.	2004
7	LM Liz-Marzán, PV Kamat, Eds., Nanoscale Materials, Kluwer Academic Publishers, Boston.	2003
8	CNR Rao, A Müller, AK Cheentham, Eds., Chemistry of Nanomaterials, Wiley – VCH, Weinhei	2004
9	G Ozin, A Arsenault, Nanochemistry - A Chemical Approach to Nanomaterials, Springer, Canada	2005

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

1. Subject Code: **NT – 511** Course Title: **Nanoscale Modeling and Simulation**

2. Contact Hours Credits: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: 03 Practical: 0

4. Relative Weightage: CWS: **25** : PRS: **00** MTE:**25** ETE: **50**

5. Credits: 04

6. Semester: **Autumn**

7. Pre-requisite: None

8. Subject Area: **PG-12**

9. Objective of the Course: This course would introduce the panoramic views of various approaches used for modeling and simulation of nanomaterials

10. **Details of Course**:

S.No.	Particulars	Contact Hours
1.	Introduction What is a model?. Modeling in materials science, Simulation vs. modeling, Simulation techniques for nano, micro, meso and continuum scales; Nanoscale and microscale - Molecular Dynamics and Monte Carlo; Mesoscale - phase-field, MC, Cellular automata; Macroscale - FD, FE, FV.	**8**
2.	**Statistical Mechanics** Statistical mechanics in atomic-scale simulation, Phase Transition, Ergodicity and broken symmetry, Ginzburg Criterion, Ferromagnetic Ising Model, Ensembles and averages pertaining to the nanomaterials	**9**
3.	**Molecular Dynamics** Introduction, Interatomic potentials, Equations of motion, integration, Pair Distribution, constraints and free energy. Time Correlation functions and spherical densities, Velocity autocorrelation functions, Time Correlation function and relaxation times. Applications for determining the grain boundary, dislocation, properties of Nanomaterials	**9**
4.	***Monte Carlo Simulation*** Probability Theory - Markov Chains and Masters Equation, Random Number Generation, Sampling Theory, Application to thermodynamic and kinetic properties, and microstructural evolution of nanomaterials	**8**

5.	**Phase –field models** Introduction, Alan-Cahn model, Energy functional, Applications in microstructural simulation of micro and nanomaterials.	**8**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of Author (s) / Book/ Publisher	Year of Publication
1.	R.Phillips, Crystals, Defects and Microstructures: Modeling Across Scales, Cambridge University Press., Cambridge, U.K.	2001
2.	M. M. Wolfson, G. J. Pert, An Introduction to Computer Simulation, Oxford Press, Oxford, U.K	1999
3.	D. Raabe, Computational Materials Science, Wiley-VCH,	1998
4.	D.P. Landau, Kurt Binder, A Guide to Monte Carlo Simulation in Statistical Physics, Cambridge University Press, Cambridge, U.K	2005
5.	D. Frenkel and B. Smit, Understanding Molecular Simulation, Academic Press, London, U.K,	1996

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

1. Subject Code: **NT 502** Course Title: **Structural Analysis of Nanomaterials**

2. Contact Hours Credits: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: 03 Practical: 0

4. Relative Weightage: CWS: **25** PRS: 00 MTE: **25** ETE: **50**

5. Credits: 04

6. Semester: **Autumn/Spring**

7. Pre-requisite: None

8. Subject Area: PG-14

9. Objective of the Course: This course aims at imparting the knowledge on structural aspects of nanomaterials.

10. **Details of Course:**

S.No.	Particulars	Contact Hours
1.	***Introduction*** Electromagnetic radiation, continuous spectrum, absorptionl filters, production and detection of X-rays, safety precautions	**5**
2.	**Geometry of Crystals** Lattices, crystals systems, symmetry, primitive and nonprimitive cells, Lattice directions and planes, Crystal structure, Atom size and coordination, Crystal shape, Twinned crystals, Stereographic projection.	**5**
3.	**Directions of Diffracted Beams** Diffraction, Bragg law, X-ray spectroscopy, Diffraction directions, methods, diffraction under non-ideal conditions.	**5**

4.	**Intensities of Diffracted Beams-** Scattering by an electron, atoms, and unit cell. Structure-factor calculation, application to powder method, multiplicity factor, Lorenz factor, absorption factor, temperature factor, Examples of intensity calculation, measurement of X-ray intensity.	**5**
5.	**Structural Studies of Nanomaterials** Reciprocal Lattice, Ewald's Sphere and its application, Stereographic projections for structural analysis of nanomaterials. Band Structure and microstructure of new materials. Direction and Intensity of X-ray for different crystal structures, Methods of indexing complex structures. Principles of emerging nanoscale X-ray techniques such as small angle X-ray scattering and X-ray absorption fine structure (XAFS), Electron and Neutron diffraction techniques and their application to nanomaterials; grain size, phase formation, texture, stress analysis, etc.	**10**
6.	**Structural Defects in Nanomaterials** Defects in nanomaterials, Effects of Dislocations on crystal structure of nanomaterials, Analysis of defects by Analytical tools.	**6**
7.	**Phase Transformation Behavior** Understanding the phase transformation behavior of nanomaterials using analytical tools such as XRD, FESEM, TEM, AFM and STM	**6**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of Author (s) / Book/ Publisher	Year of Publication
1.	**B D Cullity, S R Stock, and S Stock**, Elements of X-ray diffraction, 2001, Prentice Hall, 3rd Edition, New Jersey	2001
2.	**R Phillips**, Crystals, Defects and Microstructures, 2001, Cambridge University Press, Cambridge, U.K	2001
3.	**Z L Wang**, Characterization of Nanophase Materials, Wiley-VCH., Weinheim, Germany	2000
4	**M De Graef, M E McHenry**, An introduction to crystallography, diffraction and symmetry, Cambridge University Press, UK.	2007
5	**S M. Allen, E L Thomas,** The Structure of Materials: (MIT Series in Materials Science and Engineering), John Wiley & Sons, US.	1999

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

1. Subject Code**: NT-512;** Course Title**: Technology of Nanostructured Fabrications**

2. Contact Hours Credits: **L: 3** **T: 0** **P: 2**

3. Examination Duration (Hrs): Theory: 03 Practical: 00

4. Relative Weightage: CWS: 15 PRS: 15 MTE: 30 ETE: 40

5. Credits: **04**

6. Semester: **Autumn/Spring**

7. Pre-requisite: None

8. Subject Area: PG-14

9. **Objective of the Course:** The objective of this course is to introduce the students about application of thin film technology to fabricate nanoelectronic, optical and magnetic data storage devices.

10. Details of Course

S. No.	Particulars	Contact Hours
1.	**Introduction to Nanostructures:** Overview of thin film technology for various nanotechnology applications, Miniaturization of electrical and electronic devices, Moore's law. Epitaxial growth of thin films, Homoepitaxy and heteroepitaxy; lattice misfit and imperfections, thin film superlattice.	**6**
2.	**Production of Nanolayers (PVD &CVD Techniques)**: Thermal evaporation, Sputtering, Molecular beam epitaxy (MBE) and Pulsed laser deposition (PLD), Chemical vapour deposition (CVD)	**11**
3.	**Introduction to Various Lithography Techniques:** Introduction & Limitation of Photolithography, X-ray Lithography, Electron Beam Lithography, Nanoimprinting & Soft nanolithography, Dip Pen nanolithography	**12**
4.	**Applications and Emerging Techonologies:** Thin films for micro & nanoelelctronics, MEMS, NEMS, superhard coatings, solar cells, Fuel cells, superconducting and GMR devices, biosensors, Miniturization of Biomedical instruments, Gas sensors.	**13**
	Total	**42**

11. **Suggested Books:**

S. No.	Name of Author (s) / Book/ Publisher	Year of Publication
1.	M. Madou, Fundamentals of Microfabrication, CRC Press	1997
2.	W.R. Fahrner, Nanotechnology and Nanoelectronics, Springer	2005
3.	R.K. Waits, Thin film deposition and patterning, American Vacuum Society	1998
4.	K.N. Tu, J.W. Mayer and L.C. Feldman, Electronic Thin Film Science for Electrical Engineers and Materials Scientists, American Vacuum Society.	1992
5.	C.P. Poole, Introduction to Nanotechnology, John Wiley & Sons	2003
6.	J.A. Venables, Introduction to Surface and Thin Film Processes, Academic Press	2000
7.	J. l. Vassen and W. Kem, Thin Film Procss, Acadmic Press New York	1990
8.	M. Ohring, Materials Science of Thin Films, Academic Press	2002
9.	D. Callister Jr., Materials Science and Engineering: An Introduction 6th Edition. William John Wiley & Sons.	2003

List of practicals

1. **Production and measurement of vacuum.**
2. **Aluminum thin film deposition using vacuum evaporation technique**
3. **Optical transmission and reflectivity measurement of thin films using UV-VIS- NIR spectrometer.**
4. **Band gap measurement using spectrophotometer.**
5. **X-ray diffraction studies of amorphous, polycrystalline and epitaxial thin films.**
6. **Surface morphology of thin films using field emission scanning electron microscopy (FESEM).**

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

1. Subject Code: **NT- 522** Course Title: **Mechanical Behavior of Nano- & Amorphous Materials**

2. Contact Hours: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: **03** Practicals: **00**

4. Relative Weight age: CWS: **25** PRS: **00** MTE: **25** ETE: **50**

5. Credits: **04**

6. Semester**:** **Autumn/Spring**

7. Pre-requisite: None

8. Subject Area: PG- 14

9. Objective of the Course: The aim of this course is to provide an understanding of the mechanical behavior of nanomaterials.

10**. Details of the Course:**

S.No	Particulars	Contact Hours
1.	**Introduction:** Difference between nanocrystalline materials and bulk materials, Deformed solid-state nanostructures, peculiarities in the structures of nanocrystalline materials- Structural and induced defects.	**4**
2.	**Dislocations in Materials:** Introduction to dislocation, disclinations, desperations; isotropic and anisotropic stress fields, Energies of dislocations; Stability of dislocation in crystal structure, interaction between dislocations, impurities, microparticles. Plastic deformation of amorphous materials.	**7**
3.	**Yield Stress of Nanocrystalline Materials:** Rule of Mixture approach to yield stress, Key mechanisms to plastic deformation: Lattice dislocation motion, evolution of grain boundary defect structures, Comparison between	**7**
	deformation mechanisms and effect of a grain size distribution, Grain boundary sliding and triple junction migration, Triple Junction diffusion, and abnormal Hall-Petch effect dependence.	
4.	**Localization of Plastic Flow in Nanocrystalline Materials:** Concepts of cellular dislocation - Nucleation and kinetics of cellular dislocation, Concepts of grain boundary dislocation, Transformation of grain boundary dislocations at triple junctions. Strengthening and softening under super plastic deformation.	**7**

5	**Rotational Plastic Deformation in Nanocrystalline Materials:** Generation and development of misorientation bands – Misorientation bands in metals under large deformation, Models for disclination configuration at grain boundary junction, Propagation of misorientation bands, Motion of grain boundary disclinations – Crossover from grain boundary sliding to rotational deformation.	**7**
6	**Disclination and Amorphization at Grain Boundaries:** Splitting of triple junction disclination and amorphization of the triple junction – Energy of wedge disclination in a cylinder, necessary condition for splitting, microcrack initiation at an amorphised triple junction, nanocrack generation at a wedge disclination.	**7**
7	**Nanoindentation Techniques:** Principles and Measurement of elastic and plastic properties of nanomaterials	**3**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of the Author(s)/Book/Publisher	Year of Publication
1.	M.J. Zehetbauer and Y.T. Zhu, Bulk Nanostructured Materials, Wiley WCH, Germany	2008
2.	Y.Gutkin, I.A. Ovid'ko and M. Gutkin, Plastic Deformation in Nanocrystalline Materials, Springer, Berlin, Germany	2004
3.	T. Courtney, Mechanical Behavior of Materials (Material Science/metallurgy Series), McGraw Hill, London.	1999
4.	A. C. Fischer Cripps, Nanoindentation, Springer, New York.	2002
5.	D. Hull, D.J. Bacon, Introduction to Dislocation, Fourth Edition, Butterworth-Heinemann, U.K	2001

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

1. Subject Code: **NT – 532** Course Title: **Supramolecular Chemistry of Nanomaterials**

2. Contact Hours Credits: **L: 3** **T : 1** **P: 0**

3. Examination Duration (Hrs): Theory: 03 Practical: 0

4. Relative Weightage: CWS: **25** PRS: 00 MTE: **25** ETE: **50**

5. Credits: 04 6. Semester: **Autumn/Spring**

7. Pre-requisite: None.

8. Subject Area: PG-14

9. Objective of the Course: Students will be exposed to the role of self-assembly in nature, their synthesis and fabrication in laboratory, and applications in multidisciplinary areas.

10. **Details of Course**:

S.No.	Particulars	Contact Hours
1.	**Introduction to Supramolecular Chemistry** – Inspiration, history and definitions. Molecular forces (role of non-covalent interactions in supramolecular chemistry) and self-assembly methods. Synthesis of macrocycles; synthesis of receptors for cations anions, and neutral molecules; non-covalent synthesis; metal containing molecular geometries.	**10**
2.	**Molecular Structures -** Size and shape – Self-assembled molecular structures (Molecular containers, metalla-cages and capsules, molecular scale machines (mechanical rotors, gears, brakes, etc.) and molecular switches). Self-assembling block copolymers, self-assembly of large building blocks, Nanorod, nanotube, and nanowire self-assembly. Nanocluster self-assembly. Core shell nanoparticles.	**12**
3.	**Synthesis and Fabrication –** 'Top-down' vs. 'bottom-up' approaches, Microspheres - Colors from the Beaker, Microporous and Mesoporous Materials.	**8**
4.	**Applications of Self-assembled Nanomaterials –** Molecular recognition (artificial ionophores, cyclodextrins, etc.). Semiconductor nanomaterials, Optoelectronic nanomaterials, Nanostructured catalysts (catalysis in nanoporous materials), Bio-nanomaterials and Bioinspiration (Protein folding, assembly and structure, Protein misfolding and diseases, Nano-imaging and Nano-drugs).	**12**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of the Author(s)/Book/Publisher	Year of Publication
1.	T. Pradeep, Nano: The Essentials, Tata McGrawHill, New Delhi	2007
2.	G. Ozin, A. Arsenault, Nanochemistry. A Chemical Approach to Nanomaterials, RSC, London	2005
3.	Z. L. Wang, Z. Zhang, Y. Liu, Handbook of Nanophase and Nanostructured Materials, Kluwer Academic, New York	2002
4.	G. Cao, Nanostructures and Nanomaterials. Synthesis, Properties and Application, Imperial College Press, London	2004
5.	P. Gomez-Romero, C. Sanchez, Functional Hybrid Materials, Wiley-VCH, Weinheim	2004
6.	V. Balzani, M. Venturi, A. Credi, Molecular Devices and Machines – A Journey into the Nanoworld, Wiley-VCH, Weinheim	2003
7.	J. W. Steed, J. L. Atwood, Supramolecular Chemistry, John Wiley & Sons	2000
8	J. Z. Zhang, Z. L. Wang, J. Liu, S. W. Chen, G.Y. Liu, Self-assembled Nanostructures, Kluwer Academic Publisher, New York.	2002
9	V. Anslyn, D. A. Dougherty, Modern Physical Organic Chemistry, University Science Books, Sausalito, CA.	2006

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE Centre of Nanotechnology

1. Subject Code: **NT - 542** Course Title: **Nanobiotechnology**

2. Contact Hours: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: **03** Practicals: **00**

4. Relative weightage: CWS: **25** PRS: **00** MTE: **25** ETE: **50**

5. Credits: **04**

6. Semester: **Autumn/Spring**

7. Pre-requisite: None.

8. Subject Area: PG-14

9**. Objective of Course**: This course is intended to impart the knowledge of nanoscale biological molecules, their methods of analysis, integration to macromolecules, and providing an understanding of various nanobiotechnological applications.

10. **Details of Course** :

S. No.	Particulars	Contact Hours
1	**Overview of Nanobiotechnology** Historical perspective of Integration of biology, chemistry, and material science. Opportunities and Promises of nanobiotechnology.	2
2	**Biological Molecules and their Analysis** Complexity and size of biological molecules – DNA, RNA, proteins and carbohydrates. Role of various bonds in biological molecules. Intermediary metabolism and importance of macromolecules in health and disease. *Techniques* – Biochemical analyses, Electrophoretic and chromatographic analyses - basic principles and applications.	8
3	**Single Molecule Approaches in Biotechnology** Fluorescence spectroscopy - Fluorescent probes for analysis of proteins and nucleic acids. Labeling of proteins and nucleic acids by various fluorescent dyes. Molecular beacons and applications.	4
4	**Microbiology and Nanotechnology –** *Bacteria and Viruses* **-**Prokaryotic complexity and size distribution. General account of bacteria and viruses – structure, life cycle and growth properties. Bacteria and viruses in human health and diseases. *Bacterial signaling and sensing* **-** Bacterial cell-to-cell communication, quorum sensing, chemotaxis. Bacterial signaling in host-pathogen interaction.	6

5	**Crystallization of Biological Molecules – Protein Based Nanostructures** Overview of protein crystallization, Methods of crystallization. Importance of macromolecular structures in human health and diseases. Drug discovery using three-dimensional structural approaches.	6
6	**Nanomaterials used in Biotechnology** Nanoparticles, carbon nanotubes, quantum dots and buckyballs interface with biological macromolecules. Biological perspectives of nanomaterials – impact of nanomaterials in biological processes – tolerance by immune systems and toxicity. *Nucleic acid Engineering*- Modifications of DNA for nano-technological applications. Nanostruture assembly using DNA.	7
7	**Applications of Nanobiotechnology –** *Nano-Biosensing*- Biosensors and nanobiosensors – basics. Design and types of nano-biosensors. DNA aptamers for nano-biosensing and drug discovery. *Nano-Medicine*- Impact of nanotechnology in health and medicine – overview. Promising applications of nanomedicine- recent concepts- implantable devices, targeted drug delivery for cancer and other diseases. *Synthetic Biology* - Self assembly of nucleic acids into nanostructures, nanomotors and nanoengines based on nucleic acids	6
8	**Chemical Biology and Systems Biology** Small molecules as antibiotics – mode of action, chemical genetics, nanotechnology and high throughput screening for drug discovery.	3
	Total	**42**

11. **Suggested Books:**

S. No.	Name of Books/Authors	Year of Publication
1.	J.M. Berg, J.L. Tymoczko and L. Stryer, Biochemistry, 6th Ed. – W. H. Freeman and Company, NewYork	2006
2.	D.S. Goodsell, Bionanotechnology: Lessons from Nature, Wiley Press	2004
3.	C. M. Niemeyer and C. A. Mirkin- (Editor), Nanobiotechnology: Concepts, Applications and Perspectives, Wiley Press	2004
4	C. Walsh, Antibiotics: Actions, Origins, and Resistance, ASM Press.	2003
5	D. P. Arya , Aminoglycoside Antibiotics: From Chemical Biology to Drug Discovery - Wiley Press.	2007
6	V. Labhasehwar and D. L. Leslie-Pelecky (Editor), Biomedical Applications of Nanotechnology, Wiley Press	2007
7	S. Klussman, The Aptamer Handbook: Functional Oligonucleotides and their Applications , Wiley-VCH Press.	2006
8	R. L. Poulter, J. Adams, T. Knowler and D. P. Leader, The Biochemistry of the Nucleic Acids- Springer-Verlag GmbH	2007

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE Centre of Nanotechnology

1. Subject Code: **NT - 552** Course Title: **Physics of Nanomaterials**

2. Contact Hours: **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs): Theory: **03** Practicals: **00**

4. Relative weight age: CWS: **25** PRS: **00** MTE: **25** ETE: **50**

5. Credits: **04**

6. Semester: **Autumn/Spring**

7. Pre-requisite: None

8. Subject Area: PG-14

9. Objectives: This course is aimed at providing physics related concepts of nanomaterials.

10. **Details of Course**:

S.No.	Particulars	Contact Hours
1	***Introduction*** **-** An overview of quantum mechanical concepts related to low-dimensional systems.	4
2	***Concepts Related to Electronic Structure*** **–** Direct lattice, Reciprocal lattice, Energy bands, Direct- and Indirect- gap semiconductors, Variation of energy bands with alloy composition and its exploitation for devices, Lattice matching, Effective mass, Electron statistics, carrier concentration and Fermi level.	5
3	***Hetrostructures and Electron states*** **–** Heterojunctions, Type I and Type II heterostructures, Classification of Quantum confined systems, Electrons and holes in Quantum wells, Electronic wavefunctions, energy subbands and density of electronic states in Quantum wells, Quantum wires, and Quantum dots, Effective mass mismatch in heterostructures, Coupling between Quantum wells, Superlattices, Wavefunctions and Density of States for superlattices, Excitons in bulk, in Quantum structures and in heterostructures, The unit cell for quantum well, for quantum wire and for quantum dot	18
4	***Nanoclusters and Nanoparticles*** **–**Metal nanoclusters- Magic numbers, Geometric structures, Electronic structure, Bulk to nanotransition, Magnetic clusters; Semiconducting nanoparticles;	5

	Rare-gas and Molecular clusters.	
5	***Carbon Nanostructures*** **–**Carbon molecules, Carbon clusters, Structure of C60 and its crystal, Small and Large Fullerenes and Other Buckyballs, Carbon nanotubes and their Electronic structure	**6**
6	***Bulk Nanostructured Materials*** **–** Solid disordered nanostructures, Nanostructured crystals, Photonic crystals.	**4**
	Total	**42**

11. **Suggested Books:**

S.No.	Name of Books/Authors	Year of Publication
1	V.V. Mitin, V.A. Kochelap, and M.A. Stroscio, "Quantum Heterostructures: Microelectronics and Optoelectronics", Cambridge University Press	1999
2	C.P. Poole, Jr. and F.J. Owens, Introduction to Nanotechnology, Wiley India.	2006
3	P. Harrison, "Quantum Wells, Wires, and Dots: Theoretical and Computational Physics", John Wiley	2000
4	B.G. Streetman and S. Banerjee, "Solid State Electronic Devices", Prentice Hall of India	2001
5.	A. Shik, 'Quantum Wells: Physics and Electronics of Two - Dimensional Systems", World-Scientific	1997

Appendix 'D'
Senate/25.2.6

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

ACADEMIC CALENDAR FOR THE AUTUMN SEMESTER
SESSION 2008-2009

1.	Joint Entrance Examination Counselling for B.Tech. / B.Arch./ IDD / Integrated M.Sc. & Integrated M.Tech. Programmes	June 18 -21, 2008	Wed. to Sat.
2.	Joint Entrance Examination Architecture/Design Aptitude Test	June 21, 2008	Saturday
3.	Last date for submission of M.Tech. / M.Arch./ MURP / M.Phil / M.Sc. & M.Tech.(ES) dissertation.	***June 30, 2008***	Monday
4.	Declaration of JEE-2008 Counselling Result	***June 30, 2008***	Monday
5.	Joint Entrance Examination Counselling for Preparatory Courses	July 07, 2008	Monday
6.	Examinations for Summer Term Courses	***July 09-11, 2008***	Wed. – Fri.
7.	Final Evaluation of M.Tech. Dissertation of IV semester	***July 10, 2008***	Thursday
8.	Declaration of Results for Summer Term Examination	***July 15, 2008***	Tuesday
9.	Institute reopens for the session 2008-2009	July 21, 2008	Monday
10.	Counselling/Registration for PG students against vacant seats only	July 31, 2008	Thursday
11.	Registration of all UG/PG and Ph.D Students (other then New Entrants).	July 31, 2008	Thursday
12.	Classes begin for all students, other than New Entrants	August 01, 2008	Friday
13.	Registration for all New UG students including IDD/ 5 Years Integrated Courses.	August 01, 2008 (10 A.M. onwards)	Friday
14.	Registration for all New PG Students including New Research Scholars and selection for NSO.	August 02, 2008	Saturday
15.	Orientation Programme for all New UG & PG students.	August 03, 2008 (Forenoon)	Sunday

16.	Enrolment of N.C.C. / N.S.S. cadets at N.C.C. Parade Grounds of 3 UA CTR NCC	August 02 & 03, 2008 (Afternoon.)	Saturday-Sunday
17.	Class begin for all New Students including Research Scholars	August 04, 2008	Monday
18.	Closing of UG/PG/PhD. admissions	August 06, 2008	Wednesday
19	Last date for on-line Subject Registration of UG/PG/PhD students (New Entrants)	August 10-13, 2008	Sunday to Wednesday
20.	Assignment of UG Projects	August 11, 2008	Monday
21.	UG & PG Sections to send to Deptts/Centres final lists of Registered Students	August 14, 2008	Thursday
22.	Display/Dispatch of final list of on-line Subject Registration by UG/PG Section to the Department/Centres	August 22, 2008	Friday
23.	Departments to send the lists of Institute Elective to UG section to be run in Spring Semester – 2008-09	August 29, 2008	Friday
24.	Last date of submission of Seminar Report (PG students)	September 01, 2008	Monday
25.	**Mid Term Exam.- I** for all UG/PG students	September 12-13, 2008	Fri. - Sat
26.	Last date for withdrawal from a course (s)	September 19, 2008	Friday
27.	Last date of display of attendance record of students falling short of minimum attendance requirements during the middle of semester (by departments / centres)	September 22, 2008	Monday
28.	Intimation to parents/guardians of students having “short attendance” by academic Sections (UGS and PGS&R)	September 25, 2008	Thursday
29.	Intimation to the students (UG) about the Institute Electives to be run during spring semester 2008-09 by the Academic Section	September 25, 2008	Thursday
30.	Last date for submission of Project (PG students)	September 30, 2008	Tuesday
31.	Last date of submission of remaining document(s) by all new entrants (UG/PG/PhD)	September 30, 2008	Tuesday
32.	Pre subject registration for Institute Electives for spring Semester 2008-09 session for UG students	Oct .01 - 03, 2008	Wed.- Fri.

33.	Semester break (for students only)	Oct. 06 to 12, 2008	Mon. - Sun
34.	**Mid Term Exam.-II** for all UG/PG students	Oct. 20 – 21, 2008	Mon -Tues
35.	Thomso – 2008	Oct. 24 – 26, 2008	Fri.-Sun
36.	Issue of blank progress forms for Ph.D. students by the PG section to respective Deptts./Centres	October 27, 2008	Monday
37.	Last date for finalization of time tables of spring semester -2008-09 session by all departments / centres	October 27, 2008	Monday
38.	Notification of seating plan Autumn Semester Exam,	November 03, 2008	Monday
39.	Notification of dates of Exam. for common subjects.	November 06, 2008	Thursday
40.	Pre subject registration (On-line) for Spring Semester for the session 2008-09 for UG /PG/ PhD students	Nov. 06 – 09, 2008	Thur. – Sun.
41.	Filling of response forms by UG/PG students in the respective Departments /Centres	Nov. 10-14, 2008	Mon.- Fri
42.	Annual Convocation	**To be decided**	
43.	Information regarding short attendance cases to Academic Sections UGS and PGS&R by Departments/Centres	November 18, 2008	Tuesday
44.	Last date of Teaching for all UG/PG /PhD classes	November 21, 2008	Friday
45.	Display of course work evaluation	November 21, 2008	Friday
46.	Notices to students' Notice Boards regarding shortage of attendance (by Departments/Centres)	November 21, 2008	Friday
48.	Last day of evaluation of M.Tech. Dissertation for 3rd Semester & sending of satisfactory/unsatisfactory report to A.R. (PGS&R) by departments/centres	November 21, 2008	Friday
49.	Practical Examination, if any	Nov.22 to 24, 2008	Sat.- Mon
50.	Action by UG /PG / Sections to ascertain that the detained students do not appear in Exam.	November 24, 2008	Monday
51.	**End Term Exam.** for all UG/PG/Ph.D. classes including Preparatory Course	Nov.25 to Dec. 03, 2008	Tue.-Wed

52.	NCC Camp	**To be decided by DOSW**	
53.	J.M.E.T.-2009 Examination	14 December 20008	
54.	Last date to show the answer scripts of End Term Examination to the students	December 08, 2008	Monday
55.	Finalization of grades by the grade Moderation Committees	December 10, 2008	Wednesday
56.	Display of grades for all classes on Department Notice Board	December 10, 2008	Wednesday
57.	Last date for sending of grades to UG / PG Sections after scrutiny	December 11, 2008	Thursday
58.	Submission of progress reports of the Ph.D. students by the Departments/ Centres	December 12, 2008	Friday
59.	Last date for declaration of Autumn Semester results	December 13, 2008	Saturday
60.	Winter vacation for Teaching Staff	Dec. 15 - 29, 2008	Mon.- Mon.
61.	Spring Semester 2008-2009 begins	December 30, 2008	Tuesday
62.	Registration for all courses in respective Departments/Centres	January 01, 2009	Thursday
63.	Classes begin for all courses	January 02, 2009	Friday

Note: - 1. Heads of Department are requested to please plan the functions / Seminars on Saturdays and Sundays so that the Institute is able to maintain the minimum teaching days required in a semester.

2. Kavad day (Shiv Ratri) is on 30.07.2008.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. / CENTRE : PHYSICS DEPARTMENT

1. Subject Code: **IPH-08** Course Title: **Laser Physics & Quantum Opto Electronics**

2. Contact Hours: L: 3 ; T: 0 ; P: 0 ;

3. Examination Duration (Hrs.): Theory 0 3 Practical 0 0

4. Relative Weightage: **CWS** 1 5 **PRS** 0 0 **MTE** 3 5 **ETE** 5 0 **PRE** 0 0

5. Credits: 0 3 6. Semester: Autumn | Spring | Both ✓

7. Pre-requisite: PH-201 or equivalent 8. Subject Area: BGSEC

9. **Objective of Course:** To provide comprehensive knowledge on physics and engineering aspects of lasers quantum electronics and its applications

10. Details of Course:

S.No.	Particulars	Contact Hours
1.	Introduction of lasers, background, history and applications; Interaction of radiation with atoms and ions, rate equations, three and four level systems; Essential spectroscopic characteristics of atomic and molecular media; Properties of laser beams (Gaussian beam), matrix formulation of geometric optics (ABCD law), optical resonators, transverse and longitudinal modes, semiconductor laser system.	12
2.	Resonant light-atom interaction, density matrix, Rabi oscillation, dressed atom. AC Starke shift (light shift), Bloch sphere; Non-linear optics: frequency conversions; non-linear Raman-type effects; super radiance; photon echoes, phase conjugation.	8
3.	Basics of Quantum Cryptography, BBS4 protocol, error correction, single photon sources.	8
4.	Quantum computing, quantum qbits, quantum logic gates, decoherence and error correction, application of quantum computer; Deutsche's algorithm, Grovers's algorithm, Shor's algorithm, simulation of quantum system, quantum repeaters.	14
	Total	42

11. Suggested Books:

S.No.	Names of Books/Authors	Year of Publication
1.	Svelto O, "**Principle of Lasers**", Plenum Press.	1998
2.	Silfvast W T, "**Laser Fundamental**", Cambridge University Press	1996
3.	Fox M, "**Quantum Optics**", Oxford University Press	2006
4.	Nielsen M A and Chuang I, "**Quantum Computation and Quantum Information**", Cambridge University Press	2000

Appendix 'F'
Senate/25.2.13

INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE
ROORKEE – 247 667, INDIA

SENATE MANUAL

Existing	Proposed	Remarks
CHAPTER I **The Senate: Constitution, Duties and Responsibilities, Meetings**	**CHAPTER I** **The Senate: Constitution, Duties and Responsibilities, Meetings**	
1.1 Preamble	**1.1 Preamble**	
The Institutes of Technology Act, 1961 (hereinafter referred to as the Act) and the Statutes of the Indian Institute of Technology, Roorkee [hereinafter referred to as the 'Statutes'] define and delineate the duties, powers and privileges of the Senate [Sections 14, 15,28,29 of the Act and Statute 5: - Membership: Section 14 of the Act and Statute 5(1); Functions and Powers: Section 15 of the Act and Statute 5(2)]. Relevant sections of the Act and Statutes have been extracted and provided as Appendices I and II to this Manual, for ready reference. Provisions from the Appendix are frequently repeated and quoted in the main body of the text of this Manual for completeness and clarity.	The Institutes of Technology Act, 1961 (hereinafter referred to as the Act) and the Statutes of the Indian Institute of Technology, Roorkee [hereinafter referred to as the 'Statutes'] define and delineate the duties, powers and privileges of the Senate [Sections 14, 15,28,29 of the Act and Statute 5: - Membership: Section 14 of the Act and Statute 5(1); Functions and Powers: Section 15 of the Act and Statute 5(2)]. Relevant sections of the Act and Statutes have been extracted and provided as Appendices I and II to this Manual, for ready reference. Provisions from the Appendix are frequently repeated and quoted in the main body of the text of this Manual for completeness and clarity.	
The Senate is primarily concerned with the academic affairs of the Institute encompassing faculty and such Research Scientists as are engaged in teaching/ research, and instructional matters (Section 15 of the Act).	The Senate is primarily concerned with the academic affairs of the Institute encompassing faculty and such Research Scientists as are engaged in teaching/ research, and instructional matters (Section 15 of the Act).	
1.2 The Ordinances of the Institute	**1.2 The Ordinances of the Institute**	
In accordance with Section 29 of the Act, the Ordinances of the Institute shall be made by the Senate and individual Ordinances shall become effective on dates specified by the Senate for such purpose.	In accordance with Section 29 of the Act, the Ordinances of the Institute shall be made by the Senate and individual Ordinances shall become effective on dates specified by the Senate for such purpose.	

However, all Ordinances enacted by the Senate shall be submitted, as early as possible, for the consideration of the Board of Governors (BOG) which shall have the power by resolution to cancel or modify any such Ordinances, and such ordinances shall stand cancelled or modified, as the case may be, from the date of such resolution. Vide Section 28 of the Act the Ordinances may provide for all or any of the following matters, namely:-	However, all Ordinances enacted by the Senate shall be submitted, as early as possible, for the consideration of the Board of Governors (BOG) which shall have the power by resolution to cancel or modify any such Ordinances, and such ordinances shall stand cancelled or modified, as the case may be, from the date of such resolution. Vide Section 28 of the Act the Ordinances may provide for all or any of the following matters, namely:-	
(a) the admission of the students to the Institute; (b) the courses of study to be laid down for all degrees and diplomas of the Institute;	(a) the admission of the students to the Institute; (b) the courses of study to be laid down for all degrees and diplomas of the Institute;	
(c) the conditions under which students shall be admitted to the degree or diploma courses and to the examinations of the Institute, and shall be eligible for degrees and diplomas;	(c) the conditions under which students shall be admitted to the degree or diploma courses and to the examinations of the Institute, and shall be eligible for degrees and diplomas;	
(d) the conditions of award of the fellowships, scholarships, exhibitions, medals and prizes;	(d) the conditions of award of the fellowships, scholarships, exhibitions, medals and prizes;	
(e) the conditions and mode of appointment and duties of examining bodies, examiners and moderators;	(e) the conditions and mode of appointment and duties of examining bodies, examiners and moderators;	
(f) the conduct of examinations; (g) the maintenance of discipline among the students of the Institute; and	(f) the conduct of examinations; (g) the maintenance of discipline among the students of the Institute; and	
(h) any other matter which by this Act or the Statutes is to be or may be provided for by the Ordinances.	(h) any other matter which by this Act or the Statutes is to be or may be provided for by the Ordinances.	
1.3 The duties, responsibilities and powers of the Senate and the procedure to conduct Senate Meetings:	**1.3 The duties, responsibilities and powers of the Senate and the procedure to conduct Senate Meetings:**	
1.3.1 The duties, responsibilities and powers of the Senate are given in Section 15 of the Act and amplified in the Statute 5(2). These duties, responsibilities and powers are exercised by the Senate itself and/or through the following bodies/committees, namely:-	**1.3.1** The duties, responsibilities and powers of the Senate are given in Section 15 of the Act and amplified in the Statute 5(2). These duties, responsibilities and powers are exercised by the Senate itself and/or through the following bodies/committees, namely:-	
(i) The Executive Committee of the Senate;	(ii) The Executive Committee of the Senate;	
(ii) The Boards, Standing Committees and Advisory Committees of the Senate; and	(ii) The Boards, Standing Committees and Advisory Committees of the Senate; and	
(iii) The Academic Departments and Centres, including their	(iii) The Academic Departments and Centres, including their	

Boards/Committees. **1.3.2** The Director shall be the *ex officio* Chairman of the Senate and, if present, shall preside over all meetings of the Senate. In his absence the Deputy Director shall preside and in the absence of both the Director and the Deputy Director, the senior-most Professor amongst the Deans present shall preside at the meeting (Statute 5(6)). The Registrar shall act as the Secretary of the Senate (Section 19(2) of the Act). **1.3.3** The Senate shall meet as often as necessary but not less than four times during a calendar year (Statute 5(3)). **1.3.4** Meetings of the Senate shall be convened by the Chairman of the Senate either on his own initiative or on a requisition signed by not less than 20% of the members of the Senate. A requisitioned meeting shall be a special meeting to discuss only those items of Agenda for which requisition is made. The requisitioned meeting shall be convened by the Chairman of the Senate on date and time convenient to him within 15 days of the notice given for such a requisition (Statute 5(4)). **1.3.5** One third of the total number of members of the Senate shall form a quorum for a meeting of the Senate (Statute 5(5)). **1.3.6** A written notice for every meeting, together with the agenda shall be circulated by the Registrar to the members (excluding those currently away from the Institute on lien/leave ex-India) of the Senate at least a week before the meeting. The Chairman of the Senate may permit inclusion of any item for which due notice could be given (Statute 5(7)). **1.3.7** Notwithstanding the provisions of sub-Statute 5(7), the Director may call an emergency meeting of the Senate at short notice to consider urgent special issues. **1.3.8** The ruling of the Chairman of the Senate in regard to all questions of procedure shall be final. **1.3.9** The minutes of the proceedings of a meeting of the Senate shall be drawn up by the Secretary of the Senate with the approval of the Chairman of the Senate and circulated to all the members of the Senate present in India inviting their comments/ amendments to the	Boards/Committees. **1.3.2** The Director shall be the *ex officio* Chairman of the Senate and, if present, shall preside over all meetings of the Senate. In his absence the Deputy Director shall preside and in the absence of both the Director and the Deputy Director, the senior-most Professor amongst the Deans present shall preside at the meeting (Statute 5(6)). The Registrar shall act as the Secretary of the Senate (Section 19(2) of the Act). **1.3.3** The Senate shall meet as often as necessary but not less than four times during a calendar year (Statute 5(3)). **1.3.4** Meetings of the Senate shall be convened by the Chairman of the Senate either on his own initiative or on a requisition signed by not less than 20% of the members of the Senate. A requisitioned meeting shall be a special meeting to discuss only those items of Agenda for which requisition is made. The requisitioned meeting shall be convened by the Chairman of the Senate on date and time convenient to him within 15 days of the notice given for such a requisition (Statute 5(4)). **1.3.5** One third of the total number of members of the Senate shall form a quorum for a meeting of the Senate (Statute 5(5)). **1.3.6** A written notice for every meeting, together with the agenda shall be circulated by the Registrar to the members (excluding those currently away from the Institute on lien/leave ex-India) of the Senate at least a week before the meeting. The Chairman of the Senate may permit inclusion of any item for which due notice could be given (Statute 5(7)). **1.3.7** Notwithstanding the provisions of sub-Statute 5(7), the Director may call an emergency meeting of the Senate at short notice to consider urgent special issues. **1.3.8** The ruling of the Chairman of the Senate in regard to all questions of procedure shall be final. **1.3.9** The minutes of the proceedings of a meeting of the Senate shall be drawn up by the Secretary of the Senate with the approval of the Chairman of the Senate and circulated to all the members of the Senate present in India inviting their comments/ amendments to the	

same. The minutes along with amendments, if any suggested, shall be placed for confirmation at the next meeting of the Senate. After the minutes are confirmed and signed by the Chairman of the Senate, they shall be recorded in the minute book which shall be kept open for inspection of the members of the Senate, the Board of Governors and the Council of the IITs at all times during office hours. (Statute 5(10)). **1.3.10** The Senate shall nominate two professors of the Institute who shall serve as representatives of the Senate on the Board of Governors (Section 11 (e) of the Act). The professors absent from the Institute on 'lien/leave' shall, however, not be considered for nomination. The procedure for nomination to the Board by the Senate is outlined in Chapter IV of the Senate Manual. *CHAPTER II* **THE EXECUTIVE COMMITTEE, BOARDS AND STANDING COMMITTEES OF THE SENATE- GENERAL PROVISIONS** **2.1** Subject to its overall superintendence and control, the Senate shall define and delineate the duties and powers of its Executive Committee(ECS), its Boards, Standing Committees and Advisory Committees, and shall hold these Committees and Boards answerable and responsible for the performance of their duties and the exercise of their powers. **2.2** Ordinarily, the Executive Committee, Boards, Standing Committees and Advisory Committees are responsible to the Senate. However, the Chairman, Senate may assign additional duties to any of the Boards/ Committees, and in the discharge of such additional duties, the Board/ Committees shall be answerable only to the Director. **2.3** The Executive Committee, Boards, Standing Committees and Advisory Committees currently recognized by the Senate are as follows:- (1) The Executive Committee of the Senate (ECS); (2) The Boards:- (i) Board for Undergraduate Studies (BUGS); (ii) Board for Postgraduate Studies & Research (BPGS&R);	same. The minutes along with amendments, if any suggested, shall be placed for confirmation at the next meeting of the Senate. After the minutes are confirmed and signed by the Chairman of the Senate, they shall be recorded in the minute book which shall be kept open for inspection of the members of the Senate, the Board of Governors and the Council of the IITs at all times during office hours. (Statute 5(10)). **1.3.10** The Senate shall nominate two professors of the Institute who shall serve as representatives of the Senate on the Board of Governors (Section 11 (e) of the Act). The professors absent from the Institute on 'lien/leave' shall, however, not be considered for nomination. The procedure for nomination to the Board by the Senate is outlined in Chapter IV of the Senate Manual. *CHAPTER II* **THE EXECUTIVE COMMITTEE, BOARDS AND STANDING COMMITTEES OF THE SENATE- GENERAL PROVISIONS** **2.1** Subject to its overall superintendence and control, the Senate shall define and delineate the duties and powers of its Executive Committee(ECS), its Boards, Standing Committees and Advisory Committees, and shall hold these Committees and Boards answerable and responsible for the performance of their duties and the exercise of their powers. **2.2** Ordinarily, the Executive Committee, Boards, Standing Committees and Advisory Committees are responsible to the Senate. However, the Chairman, Senate may assign additional duties to any of the Boards/ Committees, and in the discharge of such additional duties, the Board/ Committees shall be answerable only to the Director. **2.3** The Executive Committee, Boards, Standing Committees and Advisory Committees currently recognized by the Senate are as follows:- (1) The Executive Committee of the Senate (ECS); (2) The Boards:- (i) **Board of Studies (BOS)** (ii) **Board of Research (BOR)**	

(iii) Board for Sponsored Research & Industrial Consultancy (BSRIC); (3) Advisory Committees: (i) Library Advisory Committee (LAC); (ii) Students Affairs Council (SAC). Besides, the Academic Departments/Centres running or contributing in running academic programmes shall have the following Boards/Committees: (i) Departmental/Centre's Faculty Board (DFB/CFB); (ii) Departmental/Centre's Research Committee (DRC/CRC); (iii) Departmental/Centre's Undergraduate Committee (DUGC); (iv) Departmental/Centre's Professorial Committee (DPC/ CPC). The DRC/CRC and DUGC shall be the sub-committees of the DFB/CFB and shall have faculty members serving as their members. **2.4** The Executive Committee, Boards, Standing Committees and the Advisory Committees shall be composed of members of the Senate, other members of the Faculty of the Institute, duly registered students of the Institute and experts from outside the Institute, who may be nominated by the Senate or nominated/ elected by different bodies of the Faculty/ Students in accordance with procedures that may be laid down by it from time to time. **2.5** For the purpose of the Senate procedure a member of the Faculty/teacher/Scientific and Design Staff shall mean a "person" belonging to the teaching and/or research staff working full-time in the Institute. In the case of a "person" holding a position not clearly identifiable as above, the Senate shall decide whether he will be a member of the Faculty for the purposes of Senate procedures. **2.6** The Senate may appoint such other committees (both permanent and adhoc) as may be necessary, to carry out specific tasks that may be laid down by the Senate (sub-Statute 5(2) (d) & (e)). The members of such committees shall be nominated from amongst the members of the Senate, other teachers of the Institute, duly registered students of the Institute, and experts from outside the Institute in accordance with the procedures that may be laid down by the Senate from time to time.	(iii) Board of Sponsored Research & Industrial Consultancy (BSRIC); (3) Advisory Committees: (i) Library Advisory Committee (LAC); (ii) Students Affairs Council (SAC). Besides, the Academic Departments/Centres running or contributing in running academic programmes shall have the following Boards/Committees: (i) Departmental/Centre's Faculty Board (DFB/CFB); (ii) Departmental/Centre's Research Committee (DRC/CRC); (iii) Departmental/Centre's **Academic Committee (DAC/CAC)**; (iv) Departmental/Centre's Professorial Committee (DPC/ CPC). The DRC/CRC and **DAC/CAC** shall be the sub-committees of the DFB/CFB and shall have faculty members serving as their members. **2.4** The Executive Committee, Boards, Standing Committees and the Advisory Committees shall be composed of members of the Senate, other members of the Faculty of the Institute, duly registered students of the Institute and experts from outside the Institute, who may be nominated by the Senate or nominated/ elected by different bodies of the Faculty/ Students in accordance with procedures that may be laid down by it from time to time. **2.5** For the purpose of the Senate procedure a member of the Faculty/teacher/Scientific and Design Staff shall mean a "person" belonging to the teaching and/or research staff working full-time in the Institute. In the case of a "person" holding a position not clearly identifiable as above, the Senate shall decide whether he will be a member of the Faculty for the purposes of Senate procedures. **2.6** The Senate may appoint such other committees (both permanent and adhoc) as may be necessary, to carry out specific tasks that may be laid down by the Senate (sub-Statute 5(2) (d) & (e)). The members of such committees shall be nominated from amongst the members of the Senate, other teachers of the Institute, duly registered students of the Institute, and experts from outside the Institute in accordance with the procedures that may be laid down by the Senate from time to time.	

2.7 The constitution and tenure of members of the Boards and other Committees of the Senate shall be such as may be specified in Chapter III of the Senate Manual. The terms of office of all members, except student- members, on Boards/ Committees / Advisory Committees of the Senate shall commence on the first day of July of the academic year in which they are nominated. A replacement, if any, in any vacancy for any reason whatsoever, shall serve from the date of his/her appointment on the Board/ Committee concerned until the end of the tenure of the member he/she has replaced. The term of office of student-members on Boards/ Committees of the Senate shall commence from the date of their nomination/ election till the 30th June of the next Calendar year or till he is registered in the Institute, whichever is earlier. The membership to any Board/ Committee shall be coterminous with that of the Board/Committee. **2.8** The Chairmen and members of the Boards/Committees of the Senate shall be appointed according to the procedure outlined in Chapter IV of the Senate Manual for each Board/Committee. The Chairman shall preside over the meetings of their respective Boards/ Committees. **2.9** The Secretaries of all Boards/Committees, excepting Departmental/ Centre's Boards and Committees, shall submit to the Senate the minutes of the proceedings of the meetings of their respective Boards/Committees after they have been confirmed by the concerned Boards/Committees. Any recommendation requiring specific consideration/approval of the Senate shall be submitted as a separate item highlighting the recommendations of the concerned Board/Committee. CHAPTER III **THE EXECUTIVE COMMITTEE/BOARDS/COMMITTEES CONSTITUTION, DUTIES AND RESPONSIBILITIES** **3.1 The Executive Committee of the Senate (ECS)** **3.1.1** The Executive Committee of the Senate (ECS) shall consist of the following, namely: - (a) The Director *(ex officio),* Chairman; (b) The Deputy Director (*ex officio*); (c) All Deans of the Institute *(ex officio)*; (d) All Heads of the Departments/ Academic Centres/ Service	**2.7** The constitution and tenure of members of the Boards and other Committees of the Senate shall be such as may be specified in Chapter III of the Senate Manual. The terms of office of all members, except student- members, on Boards/ Committees / Advisory Committees of the Senate shall commence on the first day of July of the academic year in which they are nominated. A replacement, if any, in any vacancy for any reason whatsoever, shall serve from the date of his/her appointment on the Board/ Committee concerned until the end of the tenure of the member he/she has replaced. The term of office of student-members on Boards/ Committees of the Senate shall commence from the date of their nomination/ election till the 30th June of the next Calendar year or till he is registered in the Institute, whichever is earlier. The membership to any Board/ Committee shall be coterminous with that of the Board/Committee. **2.8** The Chairmen and members of the Boards/Committees of the Senate shall be appointed according to the procedure outlined in Chapter IV of the Senate Manual for each Board/Committee. The Chairman shall preside over the meetings of their respective Boards/ Committees. **2.9** The Secretaries of all Boards/Committees, excepting Departmental/ Centre's Boards and Committees, shall submit to the Senate the minutes of the proceedings of the meetings of their respective Boards/Committees after they have been confirmed by the concerned Boards/Committees. Any recommendation requiring specific consideration/approval of the Senate shall be submitted as a separate item highlighting the recommendations of the concerned Board/Committee. CHAPTER III **THE EXECUTIVE COMMITTEE/BOARDS/COMMITTEES CONSTITUTION, DUTIES AND RESPONSIBILITIES** **3.1 The Executive Committee of the Senate (ECS)** **3.1.1** The Executive Committee of the Senate (ECS) shall consist of the following, namely: - (a) The Director *(ex officio),* Chairman; (b) The Deputy Director (*ex officio*); (c) All Deans of the Institute *(ex officio)*; (d) All Heads of the Departments/ Academic Centres/ Service Centres/ Centres of Excellence	

Centres (*ex officio*); (e) The Chairman, Library Advisory Committee (LAC) (*ex-officio);* (f) The Librarian (*ex- officio);* (g) Chairman, JEE (*ex- officio);* (h) Chairman, GATE (*ex- officio);* (i) The Registrar (*ex-officio*), Secretary.	(*ex officio*); (e) The Chairman, Library Advisory Committee (LAC) (*ex- officio);* (f) The Librarian (*ex- officio);* (g) Chairman, JEE (*ex- officio);* (h) Chairman, GATE (*ex- officio);* (i) **Associate Dean, Academic (ex-officio)** (j) The Registrar (*ex-officio*), Secretary.	**Associate Dean, Academic added in the ECS**
3.1.2 Duties & Responsibilities	**3.1.2 Duties & Responsibilities**	
3.1.2.1 The ECS has the following duties and responsibilities, namely:-	**3.1.2.1** The ECS has the following duties and responsibilities, namely:-	
(i) to assist the Director in formulating mechanism for executing policy decisions taken by the Senate;	(i) to assist the Director in formulating mechanism for executing policy decisions taken by the Senate;	
(ii) to discuss matters within the purview of the Senate on which the Director desires its advice;	(ii) to discuss matters within the purview of the Senate on which the Director desires its advice;	
(iii) to make recommendations on matters that are referred to it by the Boards and/or Committees of the Senate for the consideration and approval of the Senate;	(ii) to make recommendations on matters that are referred to it by the Boards and/or Committees of the Senate for the consideration and approval of the Senate;	
(iv) to act as the "Nomination Committee" to recommend to the Senate the names of Senate members who shall serve as Senate nominees on its various Boards, Standing Committees and Advisory Committees. The ECS shall also recommend the names of such eminent persons to the Senate, who may be considered for the conferment of the Doctorate (Honoris Causa) degree and the Distinguished Alumnus Award.	(iv) to act as the "Nomination Committee" to recommend to the Senate the names of Senate members who shall serve as Senate nominees on its various Boards, Standing Committees and Advisory Committees. The ECS shall also recommend the names of such eminent persons to the Senate, who may be considered for the conferment of the Doctorate (Honoris Causa) degree and the Distinguished Alumnus Award.	
3.1.2.2 The ECS shall meet as and when necessary at the discretion of the Chairman. Fifty percent of its members shall form the quorum for its meetings.	**3.1.2.2** The ECS shall meet as and when necessary at the discretion of the Chairman. Fifty percent of its members shall form the quorum for its meetings.	
3.2 Boards	**3.2 Boards**	
3.2.1 Board for Undergraduate Studies (BUGS)	**3.2.1 Board of Studies (BOS)**	
3.2.1.1 There shall be a Board for Undergraduate Studies (BUGS), which shall consist of the following, namely:-	**3.2.1.1** There shall be a **Board of Studies**, which shall consist of the following, namely:-	
(i) The Dean, Undergraduate Studies (*ex officio*) Chairman; (ii) The immediate past Dean, Undergraduate Studies (ex	(i) The **Dean, Academic Studies** , Chairman; (ii) The immediate past **Dean, Academic Studies**;	

officio); (iii) The Dean, Post Graduate Studies and Research (ex officio); (iv) Two Senate nominees; (v) One representative of each Academic Department organizing Undergraduate Programmes nominated by the Faculty Board and also the Departments/Academic Centres contributing to UG Teaching but not having an UG Programme; (vi) The Chairman JEE *(ex officio)*; (vi) Three Students Representatives (nominated by the Dean of Students Welfare); (vii) Asstt. Registrar (UGS), Secretary (ex officio).	(iii) **The Dean, Academic Research** ; (iv) **The Associate Dean, Academic Studies**; (v) Two Senate nominees; (vi) **One representative of each Academic Department/ Academic Centre organizing Undergraduate or (and) Postgraduate programme(s) nominated by the Faculty Board and also the Departments/Academic Centres contributing regularly to UG/PG Teaching but not having an UG/PG Programme**; (vii) The Chairman JEE; (**viii**) **The Chairman, GATE;** **(ix) Chairman, PG Admission;** (x) Three Students Representatives (nominated by the Dean of Students Welfare); (xi) Asstt. Registrar (**Academic**), Secretary (ex officio).	
3.2.1.2 The Board for Undergraduate Studies shall normally have a term of two years, commencing from the first day of July of the year it has been constituted. The term of office of the nominated members on BUGS shall be coterminous with that of the BUGS.	**3.2.1.2** The **Board of Studies** shall normally have a term of two years, commencing from the first day of July of the year it has been constituted. The term of office of the nominated members on **Board of Studies** shall be coterminus with that of the **Board of Studies**.	
3.2.1.3 The term of membership of the student representatives under 3.2.1.1 (vi) above shall commence from the date they have been nominated till 30th day of June following or one year, which ever is earlier.	**3.2.1.3** The term of membership of the student representatives under 3.2.1.1 (vi) above shall commence from the date they have been nominated till 30th day of June following or one year, which ever is earlier.	
3.2.1.4 In case of any vacancy in the membership, the nominating authority shall nominate a person for the remainder of the term of the vacancy.	**3.2.1.4** In case of any vacancy in the membership, the nominating authority shall nominate a person for the remainder of the term of the vacancy.	
3.2.1.5 The Board of Undergraduate Studies (BUGS) shall continue to function on the expiry of its term until a new Board is constituted by the Senate: Provided that the period of extension shall, in no case, exceed three months.	**3.2.1.5** The **Board of Studies** shall continue to function on the expiry of its term until a new Board is constituted by the Senate: Provided that the period of extension shall, in no case, exceed three months.	
3.2.1.6 The BUGS shall meet as and when necessary but not less than two times in a Semester, and that 50% of its members shall form a quorum for its meetings.	**3.2.1.6** The **Board of Studies** shall meet as and when necessary but not less than two times in a Semester, and that 50% of its members shall form a quorum for its meetings. **3.2.1.7 Duties & Responsibilities of Board of Studies**	

3.2.1.7 Duties & Responsibilities of BUGS Subject to the approval and overall superintendence and control of the Senate, the BUGS shall:- (i) have power and jurisdiction on all matters concerning the Undergraduate (UG) and 5-year integrated (dual degree and single degree Master's) Programmes of the Institute: Provided that the Project, Seminar and Dissertation during the fifth year of the 5-year integrated programme for those students who have cleared all their UG course requirements, shall be dealt with by the Board for Post Graduate Studies and Research (BPGS&R). (ii] consider and make recommendations to the Senate/ or the Director, as the case may be, on :- (a) the starting of new academic programmes and courses of instruction, including modification/deletion/addition, if any, in the course structure and the course contents already approved; (b) the credit valuation of courses; (c) the conduct of all the examinations, of UG and 5-year integrated (dual degree and single degree Master's) programmes, evaluation of academic performance and the granting of degrees; Provided that the evaluation of the Project, Seminar and Dissertation during the fifth year of the programmes for those students who have cleared all their UG course requirements shall be under the purview of the BPGS&R. (j) such other matters as may be referred to it by the Senate or the Director. 3.2.2 Board for Postgraduate Studies and Research (BPGS&R) **3.2.2.1** There shall be a Board for Post Graduate Studies and Research (BPGS&R), which shall consist of the following, namely:- (i) The Dean, Postgraduate Studies and Research (Dean, PGS&R) *(ex officio)*, Chairman; (ii) The immediate Past Dean, PGS&R *(ex officio);*	Subject to the approval and overall superintendence and control of the Senate, the **Board of Studies** shall:- (i) have power and jurisdiction on all matters concerning the **Academic Studies i.e. UG**, 5-year integrated (dual degree and single degree Master's**) and PG** Programmes of the Institute: (ii] consider and make recommendations to the Senate/ or the Director, as the case may be, on :- (a) the starting of new academic programmes and courses of instruction, including modification/deletion/addition, if any, in the course structure and the course contents already approved; (b) the credit valuation of courses; (c) the conduct of all the examinations, of **UG**, 5-year integrated (dual degree and single degree Master's) **and PG** programmes, evaluation of academic performance and the granting of degrees; and (d) such other matters as may be referred to it by the Senate or the Director. 3.2.2 Board of Research (BOR) **3.2.2.1** There shall be a **Board of Research**, which shall consist of the following, namely:- (i) The **Dean, Academic Research (Dean, AR)** *(ex officio)*, Chairman; (ii) The immediate **past Dean, AR** *;* (iii) The **Dean, Academic Studies** *;*	

(iii) The Dean, Undergraduate Studies *(ex officio);* (iv) Two Senate Nominees; (v) One representative of each Academic Department/ Centre organizing postgraduate programmes nominated by the Faculty Board; (vi) The Chairman, GATE *(ex officio);* (vii) Three Students' Representatives (nominated by the Dean of Students' Welfare); (viii) Asstt. Registrar (PGS&R), Secretary (*ex officio)*.	*(iv)* **Associate Dean, Academic Studies;** (v) **The Chairman, PG Admission***;* (vi) Two Senate Nominees; (vii) One representative of each Academic Department/ Centre organizing research programmes nominated by the Faculty Board; (viii) Three Students' (Research Scholar Representatives) nominated by the Dean of Students' Welfare; (ix) Asstt. Registrar (Academic Research), Secretary (*ex officio)*.	
3.2.2.2 The Board of Postgraduate Studies and Research (BPGS&R) shall normally have a two year term commencing from the first day of July of the year it has been constituted. The term of office of all the members on BPGS&R shall be conterminous with that of the BPGS&R.	**3.2.2.2** The **Board of Research** shall normally have a two year term commencing from the first day of July of the year it has been constituted. The term of office of all the members on **Board of Research** shall be coterminus with that of the **Board of Research.**	
3.2.2.3 The term of membership of the student representatives under 3.2.2.1(vii) above shall commence from the date they have been nominated till 30th day of June following or one year, which ever is earlier.	**3.2.2.3** The term of membership of the student representatives under 3.2.2.1(vii) above shall commence from the date they have been nominated till 30th day of June following or one year, which ever is earlier.	
3.2.2.4 In case of any vacancy in the membership, the Director shall nominate a person for the remainder term of the vacancy.	**3.2.2.4** In case of any vacancy in the membership, the Director shall nominate a person for the remainder term of the vacancy.	
3.2.2.5 The Board of Postgraduate Studies and Research shall continue to function on the expiry of its term until a new Board is constituted by the Senate: Provided that the period of such extension shall, in no case, exceed three months.	**3.2.2.5** The **Board of Research** shall continue to function on the expiry of its term until a new Board is constituted by the Senate: Provided that the period of such extension shall, in no case, exceed three months.	
3.2.2.6 The BPGS&R shall meet as and when necessary but not less than two times in a Semester, and that 50% of its members shall form a quorum for its meetings.	**3.2.2.6** The **Board of Research** shall meet as and when necessary but not less than two times in a Semester, and that 50% of its members shall form a quorum for its meetings.	
3.2.2.7 Duties and Responsibilities of BPGS&R Subject to the approval and overall superintendence and control of the Senate, the BPGS&R shall:-	3.2.2.7 Duties and Responsibilities of Board of Research Subject to the approval and overall superintendence and control of the Senate, the **Board of Research** shall:-	
(i) have power and jurisdiction on all matters concerning PG	(i) have power and jurisdiction on all matters concerning **research programmes of the Institute;** (ii) consider and make recommendations to the Senate/ or the	

and research programmes of the Institute; (ii) consider and make recommendations to the Senate/ or the Director, as the case may be, on: (a) the starting of new academic programmes and courses of instructions including modification/ deletion/ addition, if any, in the course structure and the course contents already approved; (b) the credit valuation of courses; (c) the admission of PG and Research students; (d) the conduct of all the examinations of the PG programmes and the Project, Seminar and Dissertation of the students of 5-year integrated programmes who have completed all the course requirements of the UG programme, and pre-Ph.D. courses of the research students, evaluation of the thesis/dissertation, the evaluation of academic performance and the granting of degrees; and (e) such other matters as may be referred to it by the Senate or the Director.	Director, as the case may be, on: (a) the admission of Research students; **(b) evaluation of Ph.D. thesis/dissertation, the evaluation of academic performance and the granting of degrees; and** (c) such other matters as may be referred to it by the Senate or the Director.	
3.2.3 Board for Sponsored Research & Industrial Consultancy (BSRIC) **3.2.3.1** There shall be a Board for Sponsored Research & Industrial Consultancy (BSRIC), which shall consist of the following, namely:- (i) The Dean, Sponsored Research & Industrial Consultancy (Dean,SRIC)*(ex officio)* Chairman; (ii) Immediate Past Dean, SRIC (ex officio); (iii) One nominee (Professor/ Associate Professor/ Assistant Professor/ Scientist) of each Academic Department/Centre to be nominated by the Departmental/ Centres' Faculty Board; (iv) Two nominees of the Senate; (v) Two representatives of the Industry (to be nominated by the Director); (vi) One Representative of the Funding Agencies (to be nominated by the Director);	3.2.3 Board of Sponsored Research & Industrial Consultancy (BSRIC) **3.2.3.1** There shall be a Board for Sponsored Research & Industrial Consultancy (BSRIC), which shall consist of the following, namely:- (i) The Dean, Sponsored Research & Industrial Consultancy (Dean,SRIC)*(ex officio)* Chairman; (vii) Immediate Past Dean, SRIC (ex officio); (viii) One nominee (Professor/ Associate Professor/ Assistant Professor/ Scientist) of each Academic Department/Centre to be nominated by the Departmental/ Centres' Faculty Board; (ix) Two nominees of the Senate; (x) Two representatives of the Industry (to be nominated by the Director); (vi) One Representative of the Funding Agencies (to be nominated by the Director);	

(vii) The Asstt. Registrar (SRIC), Secretary *(ex officio)*.	(vii) The Asstt. Registrar (SRIC), Secretary *(ex officio)*.	
3.2.3.2 The BSRIC shall have a term of two years commencing from the first day of July of the year in which the Board has been constituted. The term of office of all the members shall be coterminous with that of the Board. In case of any vacancy in the membership, the Director shall nominate a person for the remainder term of the vacancy.	**3.2.3.2** The BSRIC shall have a term of two years commencing from the first day of July of the year in which the Board has been constituted. The term of office of all the members shall be coterminous with that of the Board. In case of any vacancy in the membership, the Director shall nominate a person for the remainder term of the vacancy.	
3.2.3.3 The Board shall meet as and when necessary but not less than two times in a Semester and that 50% of its members shall form a quorum for its meetings.	**3.2.3.3** The Board shall meet as and when necessary but not less than two times in a Semester and that 50% of its members shall form a quorum for its meetings.	
3.2.3.4 The BSRIC shall continue to function on the expiry of its term until a new BSRIC is constituted by the Senate: Provided that such an extension shall, in no case, exceed three months.	**3.2.3.4** The BSRIC shall continue to function on the expiry of its term until a new BSRIC is constituted by the Senate: Provided that such an extension shall, in no case, exceed three months.	
3.2.3.5 Duties & Responsibilities: Subject to the approval and over all superintendence and control of the Senate, the BSRIC shall (i) have jurisdiction on all matters pertaining to sponsored research and consultancy in the Institute; (ii) advise the Dean, SRIC on policy matters and shall make recommendations on any matter referred to it by the Director and the Senate; (iii) prepare, review and update the regulations and guidelines needed for the implementation and administration of sponsored research, training programmes and intellectual property rights, and to make its recommendations to the Senate.	3.2.3.5 Duties & Responsibilities: Subject to the approval and over all superintendence and control of the Senate, the BSRIC shall (i) have jurisdiction on all matters pertaining to sponsored research and consultancy in the Institute; (ii) advise the Dean, SRIC on policy matters and shall make recommendations on any matter referred to it by the Director and the Senate; (iii) prepare, review and update the regulations and guidelines needed for the implementation and administration of sponsored research, training programmes and intellectual property rights, and to make its recommendations to the Senate.	
3.3 Advisory Committees **3.3.1 Library Advisory Committee(LAC)** **3.3.1.1** There shall be a Library Advisory Committee (LAC), which shall consist of the following, namely:- (i) A Senior Professor to be nominated by the Director as Chairman; (ii) One faculty representative/ Scientist from each Academic	**3.3 Advisory Committees** **3.3.1 Library Advisory Committee (LAC)** **3.3.1.1** There shall be a Library Advisory Committee (LAC), which shall consist of the following, namely:- (i) A Senior Professor to be nominated by the Director as Chairman; (ii) One faculty representative/ Scientist from each Academic	

Department/ Centre; (iii) Three representatives each from the Undergraduate (UG), Postgraduate (PG) programmes, and research scholars to be nominated by the Students Affairs Council (SAC); (iv) The Librarian – Member Secretary *(ex officio).* **3.3.1.2** The LAC shall have the term of two years commencing from the first day of July of the year it has been constituted. The membership of the LAC shall be conterminous with that of the LAC. However, the student members shall serve from the date they have been nominated for a term of one year or till the following June 30, which ever is earlier. In case of any vacancy, the nominating authority shall nominate a person for the remainder term of the vacancy. **3.3.1.3** The committee shall meet at least four times in an academic year and that 50% of its members shall form a quorum for its meetings. **3.3.1.4 Duties and Responsibilities** Subject to the approval and overall superintendence and control of the Senate, the LAC shall (i) consider policy matters regarding Central Library / Departmental Libraries to make the Central Library and the Departmental Libraries knowledge repositories for smooth and quick access to and retrieval of knowledge and data bases either available freely or on subscription. The LAC shall also formulate the policy for procurement of books and journals including e-journals, databases, softwares, etc. and to render advice to the Purchase Committee for Library procurements; (ii) look in to the problems of the library users and library staff, and take such actions as it deems necessary including the making of recommendations to the Senate / the Director for consideration and direction. (iii) supervise the allocation and utilization of funds for different Academic Departments/ Centres for the purchase of books and journals for the Central and Departmental Libraries;	Department/ Centre; (iii) Three representatives each from the Undergraduate (UG), Postgraduate (PG) programmes, and research scholars to be nominated by the Students Affairs Council (SAC); **(iv) <u>Dean AR;</u>** **(v) <u>Dean AS;</u>** (v) The Librarian – Member Secretary *(ex officio).* **3.3.1.2** The LAC shall have the term of two years commencing from the first day of July of the year it has been constituted. The membership of the LAC shall be conterminous with that of the LAC. However, the student members shall serve from the date they have been nominated for a term of one year or till the following June 30, which ever is earlier. In case of any vacancy, the nominating authority shall nominate a person for the remainder term of the vacancy. **3.3.1.3** The committee shall meet at least four times in an academic year and that 50% of its members shall form a quorum for its meetings. **3.3.1.4 Duties and Responsibilities** Subject to the approval and overall superintendence and control of the Senate, the LAC shall (i) consider policy matters regarding Central Library / Departmental Libraries to make the Central Library and the Departmental Libraries knowledge repositories for smooth and quick access to and retrieval of knowledge and data bases either available freely or on subscription. The LAC shall also formulate the policy for procurement of books and journals including e-journals, databases, softwares, etc. and to render advice to the Purchase Committee for Library procurements; (ii) look in to the problems of the library users and library staff, and take such actions as it deems necessary including the making of recommendations to the Senate / the Director for consideration and direction. (iii) supervise the allocation and utilization of funds for different Academic Departments/ Centres for the purchase of books and journals for the Central and Departmental Libraries;	**Dean AR & Dean AS added**

(iv) maintain liaison between Central Library and various Academic Departments/ Centres for the networking of the Departmental Libraries with the Central Library; (v) consider the views of the faculty members regarding knowledge accessibility, and transfer, selection, subscription and purchase of books/ journals, etc. and to take such actions as are deemed necessary; (vi) consider the views of the students, including research students regarding the functioning of the Library and their problems, if any, and to take remedial and corrective actions thereon; (vii) consider and make recommendations on all such matters as are referred to it by the Senate and/ or its various Boards/ Committees, or the Director and to take actions thereon, if any.	(iv) maintain liaison between Central Library and various Academic Departments/ Centres for the networking of the Departmental Libraries with the Central Library; (v) consider the views of the faculty members regarding knowledge accessibility, and transfer, selection, subscription and purchase of books/ journals, etc. and to take such actions as are deemed necessary; (vi) consider the views of the students, including research students regarding the functioning of the Library and their problems, if any, and to take remedial and corrective actions thereon; (vii) consider and make recommendations on all such matters as are referred to it by the Senate and/ or its various Boards/ Committees, or the Director and to take actions thereon, if any.	
3.3.2 Student Affairs Council (SAC) **3.3.2.1** There shall be a Students Affairs Council of the Institute which shall function under the overall supervision and control of the Senate of the Institute. **3.3.2.2** The Students Affairs Council shall be a joint student-faculty Standing committee, which shall be governed by its own constitution subject to such conditions as may be imposed by the Senate or the Board of Governors. The SAC shall derive all its powers from the relevant authorities of the Institute. **3.3.2.3** The Students Affairs Council (SAC) shall consist of the following, namely: (i) The Director, who shall be the Chairman, *ex officio;* (ii) The Deputy Director, *ex officio;* (iii) The Dean of Students' Welfare (DOSW), *ex officio;* (iv) The Immediate Past DOSW; (v) The Dean(UGS), *ex officio;* (vi) The Dean(PGS&R), *ex officio;* (vii) The Associate Dean of Students' Welfare, *ex officio;* (viii) The Associate Dean of Students' Welfare (Discipline), *ex officio;* (ix) The Foreign Students Advisor, *ex officio;* (x) The Faculty Advisor SC/ST Cell, *ex officio;* (xi) The Chief Advisers of Functional Bodies, *ex officio;* (xii) The Secretaries of Functional Bodies, *ex officio;*	**3.3.2 Student Affairs Council (SAC)** **3.3.2.1** There shall be a Students Affairs Council of the Institute which shall function under the overall supervision and control of the Senate of the Institute. **3.3.2.2** The Students Affairs Council shall be a joint student-faculty Standing committee, which shall be governed by its own constitution subject to such conditions as may be imposed by the Senate or the Board of Governors. The SAC shall derive all its powers from the relevant authorities of the Institute. **3.3.2.3** The Students Affairs Council (SAC) shall consist of the following, namely: (i) The Director, who shall be the Chairman, *ex officio;* (ii) The Deputy Director, *ex officio;* (iii) The Dean of Students' Welfare (DOSW), *ex officio;* (iv) The Immediate Past DOSW; (v) **The Dean(AS),** *ex officio;* (vi) **The Dean(AR),**; *ex officio;* *(vii)* ***The Associate Dean, Academic Studies (ex officio);*** (viii) The Associate Dean of Students' Welfare (Mess), *ex officio;* (ix) The Associate Dean of Students' Welfare (Discipline), *ex officio;* (x) **The Associate Dean of Students' Welfare (Foreign Students)**, *ex officio;* (xi) The Faculty Advisor SC/ST Cell, *ex officio;*	**The Associate Dean, Academic Studies added**

(xiii) The Bhawan Secretaries, *ex officio;* (xiv) The Mess Secretaries, *ex officio;* (xv) The Representatives of Married Students Hostels (2); (xvi) Two Chief Wardens to be nominated by the Director on the recommendations of the Dean of Students' Welfare; (xvii) Two nominees of the Senate of the Institute; (xviii) The General Secretary of the Students Affairs Council who shall be elected from amongst the student members of the SAC; (xix) The Deputy/ Assistant Registrar (Students Affairs).	(xii) **<u>The Liaison Officer OBC;</u>** *ex officio;* (xiii) The Chief Advisers of Functional Bodies, *ex officio;* (xiv) The Secretaries of Functional Bodies, *ex officio;* (xv) The Bhawan Secretaries, *ex officio;* (xvi) The Mess Secretaries, *ex officio;* (xvii) The Representatives of Married Students Hostels (2); (xviii) Two Chief Wardens to be nominated by the Director on the recommendations of the Dean of Students' Welfare; (xix) Two nominees of the Senate of the Institute; (xx) The General Secretary of the Students Affairs Council who shall be elected from amongst the student members of the SAC; (xxi) The Deputy/ Assistant Registrar (Students Affairs).	
3.3.2.4 The term of appointment of members other than ex-officio members, i.e. elected and nominated members, shall commence from the date of their appointment to the SAC and shall expire on June 30 of the next Calendar year or till the date of continuous registration of the student, which ever is earlier.	**3.3.2.4** The term of appointment of members other than ex-officio members, i.e. elected and nominated members, shall commence from the date of their appointment to the SAC and shall expire on June 30 of the next Calendar year or till the date of continuous registration of the student, which ever is earlier.	
3.3.2.5 The Functions and Responsibilities of the SAC (a) The SAC shall be a collective forum for the presentation of the views of the students of IIT, Roorkee on any issue which may be of collective concern to them i.e. welfare, discipline, etc. The SAC shall discuss such issues and make its recommendations to the relevant authorities and the officers of the Institute for consideration and decision, if any. (b) The SAC shall oversee the overall policy formulation, coordination and review of all students affairs which are of co-curricular nature, students housing and related matters in terms of the powers vested in the Senate vide Statute 5 (2) (j). The SAC shall derive its powers from the delegation of powers by the Senate subject to its approval and overall superintendence and control; (c) The Council shall consider and ratify the constitutions of its constituent bodies and subsequent amendment by a 2/3rd majority of the 'Effective Strength' which means the strength of the entire Council, excluding the faculty members who may participate in the discussion but shall abstain from voting. If no ratification is accorded, the matter will be referred back to the constituent bodies for reconsideration in the light of the comments of the Council.	**3.3.2.5 The Functions and Responsibilities of the SAC** (a) The SAC shall be a collective forum for the presentation of the views of the students of IIT, Roorkee on any issue which may be of collective concern to them i.e. welfare, discipline, etc. The SAC shall discuss such issues and make its recommendations to the relevant authorities and the officers of the Institute for consideration and decision, if any. (b) The SAC shall oversee the overall policy formulation, coordination and review of all students affairs which are of co-curricular nature, students housing and related matters in terms of the powers vested in the Senate vide Statute 5 (2) (j). The SAC shall derive its powers from the delegation of powers by the Senate subject to its approval and overall superintendence and control; (c) The Council shall consider and ratify the constitutions of its constituent bodies and subsequent amendment by a 2/3rd majority of the 'Effective Strength' which means the strength of the entire Council, excluding the faculty members who may participate in the discussion but shall abstain from voting. If no ratification is accorded, the matter will be referred back to the constituent bodies for reconsideration in the light of the comments of the Council.	

(d) The Council shall have the authority to institute and recognize a new functional body and/or a committee or to reorganize an existing one. This shall require a 2/3td majority vote of the Council members present at the Council meeting. (e) The finalization of the annual Budget and allocation of budget to various functional constituent bodies shall be done by the Executive Committee of the SAC at the end of the previous academic session. These allocations, if deemed necessary, may be modified and approved within twenty one days of the commencement of the new session. (f) Whenever deemed necessary, the Council may audit accounts of any or all of its constituent's bodies/ Committees. (g) The Council shall normally refrain from interfering in the affairs of its constituent bodies, but may consider and review some policies or decisions of a particular body which seem to be detrimental to the interest of the student community. **3.3.2.6 The Executive Committee of the SAC** The SAC shall have an Executive Committee which shall consist of the following, namely:- 1. the Dean of Students' Welfare, *ex officio*, who shall be the Chairman; 2. the Associate Deans of Students' Welfare, *ex officio;* 3. the Foreign Students Advisor, *ex officio;* 4. two Chief Wardens of Bhawans, ex officio; 5. the Chief Advisers of concerned activities , ex officio; 6. three students (nominees of SAC); 7. the Deputy/ Assistant Registrar (Students' Affairs), *ex officio;* 8. the General Secretary (Students' Affairs), who shall be the Convener. **Functions of the Executive Committee** **3.3.2.7** The Executive Committee shall take executive decisions on matters which are not considered sufficiently important to require an immediate meeting of the SAC: Provided that such decisions must be reported to the next meeting of the SAC for its consideration and approval. Any decision taken by the Executive Committee shall cease to be in operation if it is not approved or if it is modified by the SAC.	(d) The Council shall have the authority to institute and recognize a new functional body and/or a committee or to reorganize an existing one. This shall require a 2/3td majority vote of the Council members present at the Council meeting. (e) The finalization of the annual Budget and allocation of budget to various functional constituent bodies shall be done by the Executive Committee of the SAC at the end of the previous academic session. These allocations, if deemed necessary, may be modified and approved within twenty one days of the commencement of the new session. (f) Whenever deemed necessary, the Council may audit accounts of any or all of its constituent's bodies/ Committees. (g) The Council shall normally refrain from interfering in the affairs of its constituent bodies, but may consider and review some policies or decisions of a particular body which seem to be detrimental to the interest of the student community. **3.3.2.6 The Executive Committee of the SAC** The SAC shall have an Executive Committee which shall consist of the following, namely:- 1. the Dean of Students' Welfare, *ex officio*, who shall be the Chairman; 2. the Associate Deans of Students' Welfare, *ex officio;* 3. two Chief Wardens of Bhawans, ex officio; 4. the Chief Advisers of concerned activities , ex officio; 5. three students (nominees of SAC); 6. the Deputy/ Assistant Registrar (Students' Affairs), *ex officio;* 7. the General Secretary (Students' Affairs), who shall be the Convener. **Functions of the Executive Committee** **3.3.2.7** The Executive Committee shall take executive decisions on matters which are not considered sufficiently important to require an immediate meeting of the SAC: Provided that such decisions must be reported to the next meeting of the SAC for its consideration and approval. Any decision taken by the Executive Committee shall cease to be in operation if it is not approved or if it is modified by the SAC.	

3.3.2.8 The Executive Committee (EC) of the SAC shall oversee the functions of the Students Senate and other constituent bodies of the SAC. At present the following committees are recognized by the EC of the SAC, namely:-	**3.3.2.8** The Executive Committee (EC) of the SAC shall oversee the functions of the Students Senate and other constituent bodies of the SAC. At present the following committees are recognized by the EC of the SAC, namely:-	
(i) the Discipline Committee (DC); (ii) the Students Senate (SS);	(iii) the Discipline Committee (DC); (iv) the Students Senate (SS);	
DISCIPLINE COMMITTEE	**DISCIPLINE COMMITTEE**	
3.3.2.9 The Students Affairs Council shall have a committee on students discipline, which shall consist of the following, namely:-	**3.3.2.9** The Students Affairs Council shall have a committee on students discipline, which shall consist of the following, namely:-	
1. the Associate Dean of Students Welfare(Discipline), *ex-officio,* who shall be the Chairman;	1. the Associate Dean of Students Welfare(Discipline), *ex-officio,* who shall be the Chairman;	
2. the Foreign Students' Adviser, *ex officio;*	**2. the Associate Dean (Foreign Students') , *ex officio;***	
3. Three Faculty Advisers to be nominated by the Dean of Students' Welfare, *ex officio;*	3. Three Faculty Advisers to be nominated by the Dean of Students' Welfare, *ex officio;*	
4. Two Chief Wardens to be nominated by the Dean of Students' Welfare, *ex officio;*	4. Two Chief Wardens to be nominated by the Dean of Students' Welfare, *ex officio;*	
5. Three Student Nominee of the SAC, to be nominated by the students Senate of SAC;	5. Three Student Nominee of the SAC, to be nominated by the students Senate of SAC;	
6. the Deputy / Assistant Registrar (Students Affairs); 7. the General Secretary (Students Affairs).	6. the Deputy / Assistant Registrar (Students Affairs), **ex officio;** 7. the General Secretary (Students Affairs), **ex officio**	
Functions	**Functions**	
3.3.2.10 The Discipline Committee shall enquire and investigate any matter involving students discipline and suggest suitable actions and submit the report to the Executive Committee of the SAC for further necessary actions as per existing regulations of the Institute.	**3.3.2.10** The Discipline Committee shall enquire and investigate any matter involving students discipline and suggest suitable actions and submit the report to the Executive Committee of the SAC for further necessary actions as per existing regulations of the Institute.	
STUDENTS SENATE	**STUDENTS SENATE**	
3.3.2.11 The Students Senate for UG, PG and Ph.D. students/ candidates shall consist of the following , namely:-	**3.3.2.11** The Students Senate for UG, PG and Ph.D. students/ candidates shall consist of the following , namely:-	
(1) All Counsellors (one for every 100 students or major part of 100,	(1) All Counsellors (one for every 100 students or major part of 100,	

elected by the Students, Bhawan wise); (2) All Bhawan Secretaries (one for each Bhawan); (3) All Mess Secretaries (one for each Bhawan); (4) All Secretaries of other Functional Bodies of SAC. **Functions of the Students Senate** **3.3.2.12** The Students Senate shall perform the following duties and functions, namely:- (a) to prepare budget and present audited accounts through its Executive Committee for consideration and approval of the SAC; (b) to organize activities of common interest of students community; (c) to suggest amendments to the constitution for consideration of the SAC through General Body of the Students; (d) to constitute study groups to consider matters pertaining to students' welfare; (e) to promote and maintain good behaviour and discipline amongst students' community; (f) to consider any matter referred to it by the SAC and other authorities of the Institute. **Tenure of the Students Senate** **3.3.2.13** The tenure of the Senate shall commence from the date it has been constituted and shall last on June 30 following. **3.3.2.14** (a) The Executive Committee of the Students Senate shall consist of the following members elected from amongst the members of the Students Senate, namely: (i) the General Secretary; (ii) the Joint Secretary; (iii) the Treasurer; (iv) Four Members.	elected by the Students, Bhawan wise); (2) All Bhawan Secretaries (one for each Bhawan); (3) All Mess Secretaries (one for each Bhawan); (4) All Secretaries of other Functional Bodies of SAC. **Functions of the Students Senate** **3.3.2.12** The Students Senate shall perform the following duties and functions, namely:- (a) to prepare budget and present audited accounts through its Executive Committee for consideration and approval of the SAC; (b) to organize activities of common interest of students community; (c) to suggest amendments to the constitution for consideration of the SAC through General Body of the Students; (d) to constitute study groups to consider matters pertaining to students' welfare; (e) to promote and maintain good behaviour and discipline amongst students' community; (f) to consider any matter referred to it by the SAC and other authorities of the Institute. **Tenure of the Students Senate** **3.3.2.13** The tenure of the Senate shall commence from the date it has been constituted and shall last on June 30 following. **3.3.2.14** (a) The Executive Committee of the Students Senate shall consist of the following members elected from amongst the members of the Students Senate, namely: (i) the General Secretary; (ii) the Joint Secretary; (iii) the Treasurer; (iv) Four Members.	

(b) The Dean of Students' Welfare or his nominee and Proctor shall be the Advisers to the Students Senate.	(b) The Dean of Students' Welfare or his nominee **and the Associate Dean of Students' Welfare (Discipline)** shall be the Advisers to the Students Senate.	
Formation of the Students Senate	**Formation of the Students Senate**	
3.3.2.15 Formation of the Students Senate and its Executive Committee for a given academic session shall be finalized in the Spring Semester of the previous Academic Session. The Academic Session means the period from July 1 to June 30 following.	**3.3.2.15** Formation of the Students Senate and its Executive Committee for a given academic session shall be finalized in the Spring Semester of the previous Academic Session. The Academic Session means the period from July 1 to June 30 following.	
FUNCTIONAL BODIES OF THE SAC	**FUNCTIONAL BODIES OF THE SAC**	
3.3.2.16 The Students Affairs Council (SAC) shall have the following functional bodies, namely:-	**3.3.2.16** The Students Affairs Council (SAC) shall have the following functional bodies, namely:-	
(i) the Coordinating Committee of Bhawans (CCB); (ii) the Students' Sports Organization; (iii) the Students' Club; (iv) the Students' Hobbies Club; (v) the Students' Cultural Society; (vi) the Students' Cinema Club; (vi) the Himalayan Explorers Club.	(i) the Coordinating Committee of Bhawans (CCB); (ii) the Students' Sports Organization; (iii) the Students' Club; (iv) the Students' Hobbies Club; (v) the Students' Cultural Society; (vi) the Students' Cinema Club; (vii) the Himalayan Explorers Club.	
3.3.2.17 Each institute level functional body shall be governed by its own constitution as approved by the SAC. Whereas SAC works within a rather broad framework, these functional bodies will concentrate on specified spheres of student activities, as per existing norms prevailing in the Institute so as to maintain a healthy and vibrant ambience for the overall development of the students' personality.	**3.3.2.17** Each institute level functional body shall be governed by its own constitution as approved by the SAC. Whereas SAC works within a rather broad framework, these functional bodies will concentrate on specified spheres of student activities, as per existing norms prevailing in the Institute so as to maintain a healthy and vibrant ambience for the overall development of the students' personality.	
OTHER ASPECTS	**OTHER ASPECTS**	
3.3.2.18 Besides the constitutional structure of various bodies, the other important components of students affairs, such as infra-structure, supporting staff requirements, service conditions and financial supports for smooth functioning of the Students Affairs at this residential institute shall be such as may be decided by the Institute from time to time.	**3.3.2.18** Besides the constitutional structure of various bodies, the other important components of students affairs, such as infra-structure, supporting staff requirements, service conditions and financial supports for smooth functioning of the Students Affairs at this residential institute shall be such as may be decided by the Institute from time to time.	

Appendix to para 3.3.2 **(i) COORDINATION COMMITTEE OF BHAWANS** There shall be a Coordination Committee of Bhawans which shall consist of the following, namely:- 1. the Dean of Students Welfare (DOSW) or his nominee; *ex officio,* Chairman; 2. the Associate Dean of Students Welfare (ADOSW), *ex officio;* 3. the Chief Wardens of Bhawans, *ex officio;* 4. the Wardens of Bhawans, *ex officio;* 5. one Mess/Stores in-charge (Manager by rotation) , *ex officio;* 6. the Accounts Officer/Accounts in-charge (Accountant by rotation), *ex officio;* 7. the Bhawan Secretaries (all Bhawans) , *ex officio;* 8. the mess Secretaries (all Bhawans) , *ex officio;* 9. one Councilor representing each mess, *ex officio.* A Member Secretary shall be elected by the Students Councilors or may be nominated by the Chairman. (a) Bhawan Council (For each Bhawan) There shall be a Bhawan Council for each Bhawan/ Students Hostel of the Institute. The Bhawan Council shall consist of the following, namely:- 1. the Chief Warden, *ex officio;* Chairman 2. the Warden, *ex officio;* 3. the Bhawan Prefect, Asstt. Warden (Residential), ex officio; 4. the Bhawan Secretary, *ex officio;* 5. the Mess Secretary, *ex officio;* 6. the Bhawan Councilors , *ex officio.* (b) Mess Working Committee (for each Bhawan) There shall be a Mess Working Committee for each Bhawan, which shall consist of the following, namely:- 1. the Warden, Chairman, *ex officio;* 2. the Bhawan Prefect, Asstt. Warden (Residential), ex officio; 3. the Mess/Store in-charge, Manager; 4. the Mess Councilors, Members;	**Appendix to para 3.3.2** **(i) COORDINATION COMMITTEE OF BHAWANS** There shall be a Coordination Committee of Bhawans which shall consist of the following, namely:- 1. the Dean of Students Welfare or his nominee; *ex officio,* Chairman; 2. the Associate Dean of Students Welfare **(Mess)**, *ex officio;* 3. the Chief Wardens of Bhawans, *ex officio;* 4. the Wardens of Bhawans, *ex officio;* 5. one Mess/Stores in-charge (Manager by rotation) , *ex officio;* 6. the Accounts Officer/Accounts in-charge (Accountant by rotation), *ex officio;* 7. the Bhawan Secretaries (all Bhawans) , *ex officio;* 8. the Mess Secretaries (all Bhawans) , *ex officio;* 9. one Councilor representing each mess, *ex officio.* A Member Secretary shall be elected by the Students Councilors or may be nominated by the Chairman. (a) Bhawan Council (For each Bhawan) There shall be a Bhawan Council for each Bhawan/ Students Hostel of the Institute. The Bhawan Council shall consist of the following, namely:- 1. the Chief Warden, *ex officio;* Chairman 2. the Warden, *ex officio;* 3. the Bhawan Prefect, Asstt. Warden (Residential), ex officio; 4. the Bhawan Secretary, *ex officio;* 5. the Mess Secretary, *ex officio;* 6. the Bhawan Councilors , *ex officio.* (b) Mess Working Committee (for each Bhawan) There shall be a Mess Working Committee for each Bhawan, which shall consist of the following, namely:- 1. the Warden, Chairman, *ex officio;* 2. the Bhawan Prefect, Asstt. Warden (Residential), ex officio; 3. the Mess/Store in-charge, Manager;	

5. the Bhawan Secretary, Member, 6. the Mess Secretary, Member Secretary . **(ii) STUDENTS SPORTS ORGANISATION** There shall be a Students Sports Organization which shall be managed by the Sports Council. The Sports Council shall consist of the following, namely:- 1. the Chief Adviser, *ex officio;* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the Faculty Advisers - one for each activity, *ex officio;* 4. the Sports Officers, *ex officio;* 5. the Secretary (One for each activity) , *ex officio;* 6. one Member from the Married Students' Hostels (to be nominated by the Dean of Students' Welfare]. **(iii) STUDENTS' CLUB** There shall be a Students Club which shall be managed by the Club Council. The Club Council shall consist of the following, namely:- 1. the Chief Adviser, Chairman, *ex-officio;* 2. the Deputy Chief Adviser, *ex officio;* 3. the Faculty Advisers for each unit) , *ex officio;* 4. the Secretaries, *ex officio;* 5. one Councilor from each Bhawan to be nominated by the Bhawan Council; 6. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare]. **(iv) STUDENTS' HOBBIES CLUB** There shall be a Students Hobbies Club which shall be managed by a Hobbies Club Council. The Hobbies Club Council shall consist of the following, namely:- 1. the Chief Advisor, Chairman, *ex officio;* 2. the Deputy Chief Advisor, *ex officio;* 3. the Faculty Advisers (one for each activity) , *ex officio;* 4. the Secretaries (one for each activity) , *ex officio.* **(v) STUDENTS' CULTURAL SOCIETY** There shall be a Students Cultural Society which shall be managed by the Cultural Society Council. The Council shall consist of the following, namely:-	4. the Mess Councilors, Members; 5. the Bhawan Secretary, Member, 6. the Mess Secretary, Member Secretary . **(ii) STUDENTS SPORTS ORGANISATION** There shall be a Students Sports Organization which shall be managed by the Sports Council. The Sports Council shall consist of the following, namely:- 1. the Chief Adviser, *ex officio;* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the Faculty Advisers - one for each activity, *ex officio;* 4. the Sports Officers, *ex officio;* 5. the Secretary (One for each activity) , *ex officio;* 6. one Member from the Married Students' Hostels (to be nominated by the Dean of Students' Welfare]. **(iii) STUDENTS' CLUB** There shall be a Students Club which shall be managed by the Club Council. The Club Council shall consist of the following, namely:- 1. the Chief Adviser, Chairman, *ex-officio;* 2. the Deputy Chief Adviser, *ex officio;* 3. the Faculty Advisers for each unit) , *ex officio;* 4. the Secretaries, *ex officio;* 5. one Councilor from each Bhawan to be nominated by the Bhawan Council; 6. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare]. **(iv) STUDENTS' HOBBIES CLUB** There shall be a Students Hobbies Club which shall be managed by a Hobbies Club Council. The Hobbies Club Council shall consist of the following, namely:- 1. the Chief Advisor, Chairman, *ex officio;* 2. the Deputy Chief Advisor, *ex officio;* 3. the Faculty Advisers (one for each activity) , *ex officio;* 4. the Secretaries (one for each activity) , *ex officio.* **(v) STUDENTS' CULTURAL SOCIETY** There shall be a Students Cultural Society which shall be managed by the Cultural Society Council. The Council shall consist of the	

1. the Chief Adviser, *ex officio,* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the faculty Adviser(s) (one for each activity) , *ex officio;* 4. the Secretaries (one for each activity or group of activities) , *ex officio;* 5. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **(vi) STUDENTS' CINEMA CLUB** There shall be a Students Cinema Club which shall be managed by the Cinema Club Council. The Cinema Club Council shall consist of the following, namely:- 1. the Chief Adviser, *ex officio,* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the Secretary, *ex officio;* 4. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **(vii) HIMALAYAN EXPLORERS CLUB** There shall be a Himalayan Explorers Club which shall be managed by a Himalayan Explorers Club Council. The Council shall consist of the following, namely:- 1. the Chief Adviser, Chairman, *ex officio;* 2. the Deputy Chief Adviser, *ex officio;* 3. the Secretary (one for each activity or group of activities) , *ex officio;* 4. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **Note:** 1. The Secretaries of various functional bodies shall be nominated by the respective Chief Advisers. The Secretaries shall be from amongst the actively participating and willing members with a minimum of two years of activity at U.G. level or one year at P.G. level (prior to Semester for nomination). CGPA may also be considered along with any other criteria suggesting healthy and disciplined personality of the student. 2. Each Council, excluding Bhawan councils, shall have one Council, Secretary to be nominated by the respective Chief Advisers.	following, namely:- 1. the Chief Adviser, *ex officio,* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the faculty Adviser(s) (one for each activity) , *ex officio;* 4. the Secretaries (one for each activity or group of activities) , *ex officio;* 5. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **(vi) STUDENTS' CINEMA CLUB** There shall be a Students Cinema Club which shall be managed by the Cinema Club Council. The Cinema Club Council shall consist of the following, namely:- 1. the Chief Adviser, *ex officio,* Chairman; 2. the Deputy Chief Adviser, *ex officio;* 3. the Secretary, *ex officio;* 4. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **(vii) HIMALAYAN EXPLORERS CLUB** There shall be a Himalayan Explorers Club which shall be managed by a Himalayan Explorers Club Council. The Council shall consist of the following, namely:- 1. the Chief Adviser, Chairman, *ex officio;* 2. the Deputy Chief Adviser, *ex officio;* 3. the Secretary (one for each activity or group of activities) , *ex officio;* 4. one Member from the Married Students' Hostel (to be nominated by the Dean of Students' Welfare). **Note:** 1. The Secretaries of various functional bodies shall be nominated by the respective Chief Advisers. The Secretaries shall be from amongst the actively participating and willing members with a minimum of two years of activity at U.G. level or one year at P.G. level (prior to Semester for nomination). CGPA may also be considered along with any other criteria suggesting healthy and disciplined personality of the student. 2. Each Council, excluding Bhawan councils, shall have one	

3. The duties of the Secretaries and Councilors of various Functional Bodies shall be such as may be decided by the Dean of Students Welfare from time to time. For the time being, the duties prevalent at IIT, Delhi may be adopted. **3.4 The *Boards and Committees of the Departments/ Centres*** **3.4.1 The Departmental/ Centre's Faculty Board (DFB/CFB)** **3.4.1.1** Each academic Department/Centre shall have a Faculty Board called as Departmental/ Centre's Faculty Board (DFB/CFB) consisting of all full-time faculty members of the Department/Centre. All the joint faculty/Professors shall also be the members of the DFB/ CFB. **3.4.1.2** The Head of the Department/Centre shall be the *ex officio* Chairman of the DFB/CFB. **3.4.1.3** A member of the faculty of the Department/Centre shall be nominated by the DFB/ CFB to act as its Secretary for a term of one year. **3.4.1.4** The DFB/CFB shall meet as and when necessary but not less than once in a month and that 50% of its members shall form a quorum for its meetings. **3.4.1.5 Duties and Responsibilities of DFB/CFB:** (i) The DFB/CFB shall be responsible for considering all the policy issues concerning academic and research programmes of the Department/ Centre. (ii) The DFB/CFB shall consider and review the existing courses and propose and formulate new academic programmes and courses as recommended by the DUGC and DRC/CRC to it and send its recommendations to BUGS/ BPGS&R, as the case may be, for its consideration and action, if any.	Council, Secretary to be nominated by the respective Chief Advisers. 3. The duties of the Secretaries and Councilors of various Functional Bodies shall be such as may be decided by the Dean of Students Welfare from time to time. **3.4 The *Boards and Committees of the Departments/ Centres*** **3.4.1 The Departmental/ Centre's Faculty Board (DFB/CFB)** **3.4.1.1** Each academic Department/Centre shall have a Faculty Board called as Departmental/ Centre's Faculty Board (DFB/CFB) consisting of all full-time faculty members of the Department/Centre. All the joint faculty/Professors shall also be the members of the DFB/ CFB. **3.4.1.2** The Head of the Department/Centre shall be the *ex officio* Chairman of the DFB/CFB. **3.4.1.3** A member of the faculty of the Department/Centre shall be nominated by the DFB/ CFB to act as its Secretary for a term of **<u>two years</u>**. **3.4.1.4** The DFB/CFB shall meet as and when necessary, but **twice in a semester** and that 50% of its members shall form a quorum for its meetings. **3.4.1.5** For an interdisciplinary programme, a Programme Faculty Board (PFB) shall be constituted by the **<u>Dean Academic Studies</u>** in consultation with the Heads of the concerned Departments/ Centres and the Programme Coordinator. The Programme Coordinator shall be appointed by the Director in consultation with the **<u>Dean Academic Studies</u>**, and the Heads of the concerned Departments/ Centres. **3.4.1.6 Duties and Responsibilities of DFB/CFB:** (i) The DFB/CFB shall be responsible for considering all the policy issues concerning academic and research programmes of the Department/ Centre. (ii) The DFB/CFB shall consider and review the existing courses and propose and formulate new academic programmes and courses as recommended by the **<u>DAC/CAC</u>** or DRC/CRC in case of pre	**<u>Shifted from 3.4.3.3</u>**

(iii) The DFB/CFB shall consider and distribute teaching load to the faculty members. (iv) The DFB/CFB shall nominate one faculty representative of the Department to the BUGS, BPGS&R, BSRIC and the LAC. The nominees on BUGS and BPGS&R shall be members of the DUGC and DRC/CRC, respectively. (v) The DFB/ CFB of a Department/ Centre shall constitute two sub-committees, namely:- (a) The Departmental/Centre's Research Committee, DRC/ CRC, and (b) The Departmental Undergraduate Committee (DUGC) (vi) A copy of the confirmed minutes of the meetings of the DFB/CFB shall be sent to Dean, UGS and Dean, PGS&R and all the members of the DFB/ CFB, and the record of the minutes shall be maintained. **3.4.2 The Departmental /Centre's Professorial Committee (DPC/CPC)** **3.4.2.1** There shall be a Professorial Committee in each Department/ Centre consisting of all the full–time Professors/Joint Professors of the Department/Centre. In those Departments/Centres where the number of Professors/equivalent Scientists is less than five, the Director may nominate such number of Professors from other Departments/Centres as may be necessary to make the Professorial Committee a Five member committee. The tenure of such nominees shall be two years from the day of their nomination. **3.4.2.2** The Head of the Department/ Centre shall be the Chairman of the Professorial Committee. **3.4.2.3 Duties and Responsibilities of the DPC/CPC** (i) The Professorial Committee shall be the Administrative Committee of the Department/Centre and shall be responsible for all the administrative matters of the Department/ Centre which may include:-	Ph.D. courses to it and send its recommendations to **Board of Studies,** for its consideration and action, if any. (iii) The DFB/CFB shall consider and distribute teaching load to the faculty members. (iv) The DFB/CFB shall nominate one faculty representative of the Department to the **Board of Studies**, **Board of Research**, BSRIC and the LAC. The nominees on **Board of Studies** and **Board of Research** shall be members of the **DAC/CAC** and DRC/CRC, respectively. (v) The DFB/ CFB of a Department/ Centre shall constitute two sub-committees, namely:- (a) The Departmental/Centre's Research Committee, DRC/ CRC, and (b) **The Departmental/Centre's Academic Committee (DAC/ CAC)** (vi) A copy of the minutes of the meetings of the DFB/CFB shall be sent to Dean, **AS** and Dean, **AR** and all the members of the DFB/ CFB, and the record of the minutes shall be maintained. **3.4.2 The Departmental /Centre's Professorial Committee (DPC/CPC)** **3.4.2.1** There shall be a Professorial Committee in each Department/ Centre consisting of all the full–time Professors/Joint Professors of the Department/Centre. In those Departments/Centres where the number of Professors/equivalent Scientists is less than five, the Director may nominate such number of Professors from other Departments/Centres as may be necessary to make the Professorial Committee a Five member committee. The tenure of such nominees shall be two years from the day of their nomination. **3.4.2.2** The Head of the Department/ Centre shall be the Chairman of the Professorial Committee. **3.4.2.3 Duties and Responsibilities of the DPC/CPC** (i) The Professorial Committee shall be the Administrative Committee of the Department/Centre and shall be responsible for all the administrative matters of the Department/ Centre which may include:-	

(a) faculty recruitment, short listing criteria, leave applications, long leave, voluntary retirement, appointments after superannuation, appointment of Visiting Professors, Guest Faculty, etc.; (b) allocation of allotted manpower (technical and ministerial) to different laboratories/ office, etc.; (c) allocation of administrative responsibilities to the faculty members; (d) Construction and space allocation within Department/ sections including faculty office rooms, office, laboratory, library, etc.; (e) planning, long-term and short- term, for the academic development of the Department; (f) security, maintenance and upkeep of the Department/ Centre including Laboratories, building(s), lawns, etc.; (g) budgetary allocations of Departmental Operating Expenses (DOE) and other plan allocations and funds received by the Department/ Centre to various sections/ Laboratories, facilities, etc.; (h) procurement of equipment/ instruments from Institute funds or funds allocated to the Department/ Centre from any other agency; (i) general discipline of the students/ staff in the Department, etc. ; (ii) The Professorial Committee shall take all decisions in a collegiate manner with due care to improve the academic and research ambience and academic and research out put of the Department/ Centre. (iii) The Professorial Committee shall meet at least once every month and 50% of its members shall form a quorum for its meetings. The agenda item of the DPC/CPC meeting may be sent by any Professor which shall be taken up by the Committee in its next meeting and shall be disposed off in a collegiate fashion. The confirmed minutes of the meeting shall be sent to the Director and all the Professors of the Department/ Centre.	(a) faculty recruitment, short listing criteria, leave applications, long leave, voluntary retirement, appointments after superannuation, appointment of Visiting Professors, Guest Faculty, etc.; (b) allocation of allotted manpower (technical and ministerial) to different laboratories/ office, etc.; (c) allocation of administrative responsibilities to the faculty members; (d) Construction and space allocation within Department/ sections including faculty office rooms, office, laboratory, library, etc.; (e) planning, long-term and short- term, for the academic development of the Department; (f) security, maintenance and upkeep of the Department/ Centre including Laboratories, building(s), lawns, etc.; (g) budgetary allocations of Departmental Operating Expenses (DOE) and other plan allocations and funds received by the Department/ Centre to various sections/ Laboratories, facilities, etc.; (h) procurement of equipment/ instruments from Institute funds or funds allocated to the Department/ Centre from any other agency; (i) general discipline of the students/ staff in the Department, etc. ; (ii) The Professorial Committee shall take all decisions in a collegiate manner with due care to improve the academic and research ambience and academic and research out put of the Department/ Centre. (iii) The Professorial Committee shall meet at least once every month and 50% of its members shall form a quorum for its meetings. The agenda item of the DPC/CPC meeting may be sent by any Professor which shall be taken up by the Committee in its next meeting and shall be disposed off in a collegiate fashion. The confirmed minutes of the meeting shall be sent to the Director and all the Professors of the Department/ Centre.	

3.4.3 The Departmental/ Centre's Research Committee (DRC/CRC):	**3.4.3 The Departmental/ Centre's Research Committee (DRC/CRC):**	
3.4.3.1 There shall be a DRC/CRC in a Department/ Centre consisting of full-time faculty members representing all the major PG and research programmes of the Department/Academic Centre and the Head of the Department/ Centre. 1/3 of the faculty strength with a minimum of 7 members shall constitute the DRC/CRC. The membership shall be rotated among various faculty members at all cadres. The faculty representative of the Department/Centre in the BPGS&R shall also be a member of the DRC/CRC.	**3.4.3.1 <u>There shall be a DRC/CRC in a Department/ Academic Centre consisting of full-time faculty members of the department/centre nominated by DFB/CFB and all faculty cadres are represented with a minimum of 7 and maximum of 12 members. The membership of the DRC shall be such that all major specializations as approved by DFB/CFB are represented. Such specialization should have at least 3 faculty members of the department. If faculty strength of a department/centre is less than seven, short fall shall be made up by the members nominated by Dean AR from the Institute. The membership shall be rotated among various faculty members at all cadres. The faculty representative of the Department/Centre in the Board of Academic Research shall also be a member of the DRC/CRC.</u>**	
3.4.3.2 A Professor nominated by the DFB/CFB shall be its Chairman. The constitution of the DRC/ CRC shall be recommended by the DFB/ CFB and shall be approved by the Dean, PGS&R.	**3.4.3.2 <u>A Professor from amongst the members of the DRC/CRC</u>** nominated by the DFB/CFB shall be its Chairman. The constitution of the DRC/ CRC shall be recommended by the DFB/ CFB and shall be approved by the **<u>Dean Academic Research</u>**.	
3.4.3.3 For an interdisciplinary programme, a Programme Faculty Board (PFB) shall be constituted by the Dean, PGS&R in consultation with the Heads of the concerned Departments/ Centres and the Programme Coordinator. The Programme Coordinator shall be appointed by the Director in consultation with the Dean, PGS&R, and the Heads of the concerned Departments/ Centres.		
3.4.3.4 The DRC/CRC shall have a term of two- years from the date of its constitution by the DFB/ CFB. The term of office of the members of the Committee shall be cotermius with that of the committee. Any vacancy in the committee shall be filled up by another faculty member to be nominated by the DFB/ CFB and approved by the Dean, PGS&R for the remainder of the term of the member in whose vacancy the nomination is being made.	**3.4.3.3** The DRC/CRC shall have a term of two- years from the date of its constitution by the DFB/ CFB. The term of office of the members of the Committee shall be coterminus with that of the committee. Any vacancy in the committee shall be filled up by another faculty member to be nominated by the DFB/ CFB and approved by the **<u>Dean Academic Research</u>** for the remainder of the term of the member in whose vacancy the nomination is being made.	
3.4.3.5 Duties & Responsibilities of the DRC/CRC:	**3.4.3.4 Duties & Responsibilities of the DRC/CRC:**	
(i) The DRC/CRC shall be responsible for all the academic matters pertaining to all PG and research programmes of the	(i) The DRC/CRC shall be responsible for all the academic matters pertaining to **all research programmes** of the Department/	

Department/ Centre as also of PG courses pertaining to IDD programmes and the pre-Ph.D courses as specified in the Ordinances and Regulations for PG, IDD and Ph.D. programmes. (ii) For interdisciplinary programmes, the PFB shall perform the duties of the DRC. The Programme Coordinator shall perform such duties and exercise such powers of the Head of the Department as may be necessary for such a programme. (iii) The DRC/ CRC shall nominate Programme Coordinators from amongst the Professors/ Associate Professors for each PG Programme of the Department/ Centre. The Programme Coordinator shall coordinate the programme and assist the DRC/CRC and the Head of the Department/ Centre in the running of the programme. (iv) The DRC/CRC shall be responsible for the selection of students, wherever required, for PG and Ph.D. programmes, conduct of PG and Ph.D. programmes, and the allocation of M.Tech. and IDD students to faculty members for their Dissertation . (v) The DRC/CRC shall consider and make its recommendation on all the issues referred to it by the DFB/CFB and/or the Dean, UGS and the Dean PGS&R. (vi) The DRC/CRC shall meet as often as necessary but not less than once every month and its confirmed minutes shall be sent to the Dean, PGS&R for PG and research programmrs and to the Dean, UGS for IDD programmes. The minutes shall also be sent to all the faculty members of the Department/ Centre for information and necessary action. **3.4.4 The Departmental Undergraduate Committee (DUGC)** **3.4.4.1** There shall be a DUGC in each Department which shall consist of 1/3 of the full-time faculty members of the Department and the Head of the Department. All major sections and all the faculty cadres shall be represented in the DUGC and the membership shall be rotated every two years in a staggered manner. The faculty representative of the Department in the BUGS shall also be a member of the DUGC.	Centre and the pre-Ph.D courses as specified in the Ordinances and Regulations for Ph.D. programmes. (ii) The DRC/CRC shall be responsible for the selection of students, wherever required, for Ph.D. programmes, conduct of Ph.D. programmes, and the allocation of **Ph.D. students to faculty members for their Ph.D. work as per Ph.D. regulations**. (iii) The DRC/CRC shall consider and make its recommendation on all the issues referred to it by the DFB/CFB and/or the **Dean Academic Research**. (iv) The DRC/CRC shall meet as often as necessary but there should be a minimum of 3 meetings in a semester and its minutes shall be sent to the **Dean Academic Research**. The minutes shall also be sent to all the faculty members of the Department/ Centre for information and necessary action. **3.4.4 The Departmental/Centre's Academic Committee (DAC/ CAC)** **3.4.4.1** There shall be a **DAC/CAC** in each Department which shall consist of full-time faculty members. There should be minimum 7 and maximum 12 members. All major sections and all the faculty cadres shall be represented in the **DAC/CAC** and the membership shall be rotated every two years in a staggered manner. The faculty representative of the Department in the **Board of Studies** shall also be a member of the **DAC/CAC**. **If faculty strength in a department/centre is less seven, short fall shall be made up by the members nominated by Dean AR from the Institute.**	

3.4.4.2 A Professor nominated by the DFB shall be its Chairman. The constitution of the DUGC shall be recommended by the DFB and approved by the Dean, UG Studies.	**3.4.4.2** **A Professor from amongst the members of DAC/CAC** nominated by the DFB shall be its Chairman. The constitution of the **DAC/CAC** shall be recommended by the DFB and approved by the **Dean Academic Studies**.	
3.4.4.3 For an interdisciplinary programme, a Programme Faculty Board (PFB) shall be constituted by the Dean, UGS in consultation with the Head of the concerned Departments and the Programme Coordinator. The Programme Coordinator shall be appointed by the Director in consultation with the Dean, UGS, and the Heads of the concerned Departments/ Centres.		
3.4.4.4 The DUGC shall have a term of two years from the date of its constitution by the DFB. The term of office of the members of the DUGC shall be coterminous with that of the committee. Any vacancy in the committee shall be filled up by another faculty member to be nominated by the DFB and approved by the Dean, UG Studies for the remainder of the term of the member in whose vacancy the nomination is being made.	**3.4.4.3** The **DAC/CAC** shall have a term of two years from the date of its constitution by the DFB. The term of office of the members of the **DAC/CAC** shall be coterminus with that of the committee. Any vacancy in the committee shall be filled up by another faculty member to be nominated by the DFB and approved by the **Dean Academic Studies** for the remainder of the term of the member in whose vacancy the nomination is being made.	
3.4.4.5 Duties and responsibilities of the DUGC	**3.4.4.4 Duties and responsibilities of the DAC/CAC**	
(i) The DUGC shall be responsible for all academic matters pertaining to UG programmes and all UG courses of IDD programmes being run by the Department as specified in the Ordinances and Regulations for UG and IDD programmes.	(i) The **DAC/CAC** shall be responsible for all academic matters pertaining to **Academic Studies i.e. UG, PG, IDD and Integrated (M.Sc./M.Tech.) Masters Programmes** being run by the Department as specified in the Ordinances and Regulations for **UG, PG, IDD, Integrated (M.Sc./ M.Tech.) Master's** Programmes.	
(ii) For interdisciplinary programmes, the PFC shall perform the duties of the DUGC. The Programme Coordinator shall perform such duties and exercise such powers of Head of the Department as may be necessary for such a programme.	(ii) For interdisciplinary programmes, the PFC shall perform the duties of the **DAC/CAC**. The Programme Coordinator shall perform such duties and exercise such powers of Head of the Department as may be necessary for such a programme.	
(iii) The DUGC shall nominate Programme Coordinators from amongst the Professors/ Associate Professors for each UG programme of the Department/ Centre. The Programme Coordinator shall coordinate the programme and assist the DUGC and the Head of the Department/ Centre in the running of the programme.	(iii) The **DAC/CAC** shall nominate Programme Coordinators from amongst the Professors/ Associate Professors for each programme of the Department/ Centre. The Programme Coordinator shall coordinate the programme and assist the **DAC/CAC** and the Head of the Department/ Centre in the running of the programme.	
(iv) The DUGC shall meet as often as necessary but not less than once every month to consider the conduct of UG programmes, the progress of the students and any other matter concerning UG programmes.	(iv) The **DAC/CAC** shall meet as often as necessary but there should be a minimum of 3 meetings in a semester to consider the conduct of programmes, the progress of the students and any other matter concerning the programmes.	

(v) The DUGC shall consider and make its recommendation on all issues/ matters referred to it by the DFB/ Dean, UGS/BUGS. (vi) For matters of general academic interest, teaching load, etc. a joint meeting of the DUGC and DRC/CRC may be convened to discuss the matters and to take decisions thereon. (vii) The confirmed minutes of the meeting of DUGC shall be sent to the Dean, UGS and all the faculty members of the Department for information and necessary action.	(v) The **DAC/CAC** shall consider and make its recommendation on all issues/ matters referred to it by the DFB/ **Dean Academic Studies**. (vi) The minutes of the meeting of **DAC/CAC** shall be sent to the **Dean Academic Studies** and all the faculty members of the Department for information and necessary action.	
CHAPER IV **Procedure for Nomination of persons by the Senate, the Departments/ Centre and the Students Senate of the Students Affairs Council, etc.** ***4.1 Senate Nominees*** **4.1.1** The Senate shall nominate its representatives to serve on the Board of Governors (BOG) and the following Boards/Standing Committees—(i) BUGS; (ii) BPGS & R; (iii) BSRIC (iv) Library Advisory Committee (LAC); and (v) SAC. **4.1.2 Nomination of Professors as the Representatives of the Senate on the Board of Governors (BOG)** **4.1.2.1** The Senate of the Institute shall nominate two Professors as its representative to the Board of Governors (Section 11 (e) of the Act. **4.1.2.2** The procedure to be followed for nomination shall be as under: (a) A panel of three/five (for one or two nominees) senior-most Senators, who meet the under-mentioned criteria, will be prepared: (i) They should have attended at least 60% meetings of the Senate during the last five years. The number of meetings of the Senate for this purpose will include regular as well as special meetings. All types of absence including leave, deputation, sickness and EOL abroad etc. will be reckoned against 40% absence permitted during the period of five years.	***CHAPTER IV*** **Procedure for Nomination of persons by the Senate, the Departments/ Centre and the Students Senate of the Students Affairs Council, etc.** ***4.1 Senate Nominees*** **4.1.1** The Senate shall nominate its representatives to serve on the Board of Governors (BOG) and the following Boards/Standing Committees—(i) **Board of Studies**; (ii) **Board of Research**; (iii) BSRIC (iv) Library Advisory Committee (LAC); and (v) SAC. **4.1.2 Nomination of Professors as the Representatives of the Senate on the Board of Governors (BOG)** **4.1.2.1** The Senate of the Institute shall nominate two Professors as its representative to the Board of Governors (Section 11 (e) of the Act. **4.1.2.2** The procedure to be followed for nomination shall be as under: (a) A panel of three/five (for one or two nominees) senior-most Senators, who meet the under-mentioned criteria, will be prepared: (i) They should have attended at least 60% meetings of the Senate during the last five years. The number of meetings of the Senate for this purpose will include regular as well as special meetings. All types of absence including leave, deputation, sickness and EOL abroad etc. will be reckoned against 40% absence permitted during the period of five years.	

(ii) They should not be holding the position of the Deputy Director at the time of his/her nomination. (iii) They should have at least two years of service remaining in the Institute from the date of nomination to enable him or her to complete the full two year term in terms of Section 12 (3) of the Act. (iv) They should not have been members of the BOG representing the Senate on an earlier occasion for whatever duration. (b) The panel so prepared, on the basis of above eligibility criteria, would be circulated to the members of the Senate in a confidential cover by the Chairman, Senate for their suggestions on nominating the Senator(s) on the Board of Governors. Based on the feedback received from the Senators, the Chairman, Senate, on behalf of the Senate will nominate the Senator(s) for membership of the Board of Governors. (c) If a nominee of the Senate on the Board of Governors proceeds on leave of the kind due for a period exceeding six months, he would cease to be the member representing the Senate on the Board of Governors and the resultant vacancy would be filled as per the provisions of the Act and the procedure laid down by the Senate. **4.1.3** For all other Boards/Standing Committees listed under sub-section 2.3 of Chapter II of the Senate Manual, the ECS shall act as the 'Nomination Committee' and shall send its recommendations to the Senate for its consideration and approval. The Member-Secretary of the Executive Committee shall invite nominations to various Boards/ Committees from the members of the Senate at least 60 days before the end of the tenure of the functional Boards/ Committees. The Senate members absent from the Institute on lien/leave shall not be considered for such nominations. All the nominations received from the members shall be put to the ECS by the Member-Secretary in a special meeting of the ECS which shall be held at least 30 days before the end of the tenure of the members on the Boards/ Committees. The Senate shall meet in the month of June to consider and approve its nominees. For any vacancy in the nominees on the Boards/ Committees, the ECS shall take steps to fill the vacancy within three months from the date of the vacancy. **4.1.4** No Nominations shall be made by the Senate to any other	(ii) They should not be holding the position of the Deputy Director at the time of his/her nomination. (iii) They should have at least two years of service remaining in the Institute from the date of nomination to enable him or her to complete the full two year term in terms of Section 12 (3) of the Act. (v) They should not have been members of the BOG representing the Senate on an earlier occasion for whatever duration. (b) The panel so prepared, on the basis of above eligibility criteria, would be circulated to the members of the Senate in a confidential cover by the Chairman, Senate for their suggestions on nominating the Senator(s) on the Board of Governors. Based on the feedback received from the Senators, the Chairman, Senate, on behalf of the Senate will nominate the Senator(s) for membership of the Board of Governors. (c) If a nominee of the Senate on the Board of Governors proceeds on leave of the kind due for a period exceeding six months, he would cease to be the member representing the Senate on the Board of Governors and the resultant vacancy would be filled as per the provisions of the Act and the procedure laid down by the Senate. **4.1.3** For all other Boards/Standing Committees listed under sub-section 2.3 of Chapter II of the Senate Manual, the ECS shall act as the 'Nomination Committee' and shall send its recommendations to the Senate for its consideration and approval. The Member-Secretary of the Executive Committee shall invite nominations to various Boards/ Committees from the members of the Senate at least 60 days before the end of the tenure of the functional Boards/ Committees. The Senate members absent from the Institute on lien/leave shall not be considered for such nominations. All the nominations received from the members shall be put to the ECS by the Member-Secretary in a special meeting of the ECS which shall be held at least 30 days before the end of the tenure of the members on the Boards/ Committees. The Senate shall meet in the month of June to consider and approve its nominees. For any vacancy in the nominees on the Boards/ Committees, the ECS shall take steps to fill the vacancy within three months from the date of the vacancy. **4.1.4** No Nominations shall be made by the Senate to any other	

Committee in the Institute unless it is decided by the Senate otherwise.	Committee in the Institute unless it is decided by the Senate otherwise.	
4.2 ***Representatives of Departments/ Centres*** **4.2.1** The Departments/Centres are required to nominate their representatives to serve on the Board of Undergraduate Studies (BUGS), the Board of Postgraduate Studies & Research (BPGS&R), the Board for Sponsored Research & Industrial Consultancy (BSRIC), and the Library Advisory Committee (LAC) in accordance with the Constitution of these bodies (refer to Chapter III).	**4.2** ***Representatives of Departments/ Centres*** **4.2.1** The Departments/Centres are required to nominate their representatives to serve on the **Board of Studies**, the **Board of Research**, the Board for Sponsored Research & Industrial Consultancy (BSRIC), and the Library Advisory Committee (LAC) in accordance with the Constitution of these bodies (refer to Chapter III).	
4.2.2 The actual procedure to select the representatives from the Departments/ Centres shall be decided by the individual DFB/CFB.	**4.2.2** The actual procedure to select the representatives from the Departments/ Centres shall be decided by the individual DFB/CFB.	
4.3 Student Representatives **4.3.1** The SAC is required to nominate student-representatives to serve on the following Boards/ Committees, viz [i) BUGS; (ii) BPGS&R; and (iii) the Library Advisory Committee (LAC).	***4.3 Student Representatives*** **4.3.1** The SAC is required to nominate student-representatives to serve on the following Boards/ Committees, viz [i) **Board of Studies**; (ii) **Board of Research**; and (iii) the Library Advisory Committee (LAC).	
4.3.2 Three student representatives on BUGS and BPGS&R shall be nominated by the Dean of Students' Welfare.	**4.3.2** Three student representatives on **Board of Studies** and **Board of Research** shall be nominated by the Dean of Students' Welfare.	
4.3.3 The nine student-representatives on the Library Advisory Committee (LAC) shall be nominated by the Senate of the SAC (excluding the faculty members on the Senate). Three of the representatives shall be undergraduate students; Two M.Tech. students from Engineering Departments; one student from M.Sc./M.Tech. (3 year programme)/MCA/ MBA etc. streams, run by non-Engineering Departments; one research student/ candidate from Engineering Departments and one research student/ candidate from the Sciences, Humanities and Social Sciences, and Management Departments. There shall be no academic criteria for eligibility to be nominated as a student-representative on the LAC. These nominations shall be made at the first meeting of the Senate of the SAC in an academic year.	**4.3.3** The nine student-representatives on the Library Advisory Committee (LAC) shall be nominated by the Senate of the SAC (excluding the faculty members on the Senate). Three of the representatives shall be undergraduate students; Two M.Tech. students from Engineering Departments; one student from M.Sc./M.Tech. (3 year programme)/MCA/ MBA etc. streams, run by non-Engineering Departments; one research student/ candidate from Engineering Departments and one research student/ candidate from the Sciences, Humanities and Social Sciences, and Management Departments. There shall be no academic criteria for eligibility to be nominated as a student-representative on the LAC. These nominations shall be made at the first meeting of the Senate of the SAC in an academic year.	
4.4 Student Members of the SAC (i) All student-members of the SAC listed in Chapter III under sub-section 3.3.3.3 of the Manual shall be elected / nominated as per the procedure outlined in the respective constitutions of the student bodies/ councils.	***4.4 Student Members of the SAC*** (i) All student-members of the SAC listed in Chapter III under sub-section 3.3.3.3 of the Manual shall be elected / nominated as per the procedure outlined in the respective constitutions of the student bodies/ councils.	

4.5 Departments/ Centres/ Service Centres (Statutes 21 (1) & (2) The Institute currently has the following Departments, namely:- (a) Architecture and Planning (b) Biotechnology (c) Chemical Engineering (d) Chemistry (e) Civil Engineering (f) Earth Sciences (g) Earthquake Engineering (h) Electrical Engineering (i) Electronics and Computer Engineering (j) Humanities and Social Sciences (k) Hydrology (l) Paper Technology (m) Management Studies (n) Mathematics (o) Mechanical and Industrial Engineering (p) Metallurgical and Materials Engineering (q) Physics (r) Water Resources Development & Management Provided that the Board may, on the recommendation of the Senate, create or modify or abolish any Department or merge it with another Department. (2) The Institute shall have the following Academic and Service Centres, namely :- (a) Alternate Hydro Energy Centre Academic Centre (b) Central Library Academic Services Centre (c) Continuing Education Centre Academic Services Centre (d) Institute Instrumentation Centre Academic Services Centre (e) Institute Computer Centre Academic Services Centre (f) Information Superhighway Centre Academic Services Centre Provided that the Board may, on recommendation of the Senate, establish or abolish any Centre/Service Centre or merge it with another Centre/Service Centre or a Department or convert it into a Department.	**4.5 Departments/ Centres/ Service Centres/ Centres of Excellence (Statutes 21 (1) & (2)** The Institute currently has the following Departments, namely:- (a) Architecture and Planning (b) Biotechnology (c) Chemical Engineering (d) Chemistry (e) Civil Engineering (f) Earth Sciences (g) Earthquake Engineering (h) Electrical Engineering (i) Electronics and Computer Engineering (j) Humanities and Social Sciences (k) Hydrology (l) Paper Technology (m) Management Studies (n) Mathematics (o) Mechanical and Industrial Engineering (p) Metallurgical and Materials Engineering (q) Physics (r) Water Resources Development & Management Provided that the Board may, on the recommendation of the Senate, create or modify or abolish any Department or merge it with another Department. (2) The Institute shall have the following Academic Centres, Service Centres, and Centres of Excellence namely :- (a) Alternate Hydro Energy Centre Academic Centre (b) Central Library Academic Services Centre (c) Continuing Education Centre Academic Services Centre (d) Institute Instrumentation Centre Academic Services Centre (e) Institute Computer Centre Academic Services Centre (f) Information Superhighway Centre Academic Services Centre **Centre of Excellence:** (a) Centre for Nanotechnology (b) Centre for Disaster Mitigation & Management (c) Centre for Transportation System (CTRANS) Provided that the Board may, on recommendation of the	

	Senate, establish or abolish any Centre/Service Centre/ Centre of Excellence or merge it with another Centre/Service Centre/ Centre of Excellence or a Department or convert it into a Department.	
4.6 The Deans **(Statute 11)** (1) The Director may appoint Deans and Associate Deans to assist him in discharging his duties and responsibilities, in consultation with the Chairman of the Board of Governors. (2) The Deans and Associate Deans shall be appointed by the Director from amongst the teachers for a period not exceeding three years. They shall hold their offices at the pleasure of the Director. (3) The Deans and the Associate Deans shall be deemed to be the officers of the Institute and will enjoy such powers and perform such duties as may be delegated to them by the Director with the prior approval of the Board. The Associate Deans shall normally assist the respective Deans in the performance of their duties. (4) The Deans and Associate Deans shall not be entitled to any additional monetary benefit by virtue of holding their respective Offices.	***4.6 The Deans*** **(Statute 11)** (1) The Director may appoint Deans and Associate Deans to assist him in discharging his duties and responsibilities, in consultation with the Chairman of the Board of Governors. (2) The Deans and Associate Deans shall be appointed by the Director from amongst the teachers for a period not exceeding three years. They shall hold their offices at the pleasure of the Director. (3) The Deans and the Associate Deans shall be deemed to be the officers of the Institute and will enjoy such powers and perform such duties as may be delegated to them by the Director with the prior approval of the Board. The Associate Deans shall normally assist the respective Deans in the performance of their duties. (4) The Deans and Associate Deans shall not be entitled to any additional monetary benefit by virtue of holding their respective Offices.	
4.7 Head of the Department (Statute 22) (1) Each Department of the Institute shall be placed in charge of a Head who shall be selected by the Director from amongst the Professors and Associate Professors in such manner as may be laid down by the Board from time to time. Each Centre/School/Service Centre of the Institute shall be placed in charge of a Head who shall be selected by the Director from amongst the Professors/Associate Professors, Chief Scientific Officers/Principal Scientific Officers, Chief Design Engineers/ Principal Design Engineers in the Centre/School/Service Centre or in a cognate Department/Centre/School in such manner as may be laid down by the Board from time to time. Provided that when in the opinion of the Director the situation so demands, the Director may himself take temporary charge of an Department/Centre/School/Service Centre or place it under the charge of the Deputy Director or a Professor from another Department/Centre for a period not exceeding six months.	**4.7 Head of the Department (Statute 22)** (1) Each Department of the Institute shall be placed in charge of a Head who shall be selected by the Director from amongst the Professors and Associate Professors in such manner as may be laid down by the Board from time to time. Each Centre/School/Service Centre of the Institute shall be placed in charge of a Head who shall be selected by the Director from amongst the Professors/Associate Professors, Chief Scientific Officers/Principal Scientific Officers, Chief Design Engineers/ Principal Design Engineers in the Centre/School/Service Centre or in a cognate Department/Centre/School in such manner as may be laid down by the Board from time to time. Provided that when in the opinion of the Director the situation so demands, the Director may himself take temporary charge of an Department/Centre/School/Service Centre or place it under the charge of the Deputy Director or a Professor from another Department/Centre for a period not exceeding six months.	

(2) The Head of the Department/Centre/School/Service Centre shall be responsible for the entire working of the Department/ Centre/School/Service Centre, subject to the general control of the Director.	(2) The Head of the Department/Centre/School/Service Centre shall be responsible for the entire working of the Department/ Centre/School/Service Centre, subject to the general control of the Director.	
(3) It shall be the duty of the Head of the Department/Centre/ School/ Service Centre to see that the decisions of the authorities of the Institute and of the Director are faithfully carried out. He shall perform such other duties as may be assigned to him by the Director.	(3) It shall be the duty of the Head of the Department/Centre/ School/ Service Centre to see that the decisions of the authorities of the Institute and of the Director are faithfully carried out. He shall perform such other duties as may be assigned to him by the Director.	
4.8 Other Faculty Officers serving on Senate Boards/ Standing Committees	***4.8 Other Faculty Officers serving on Senate Boards/ Standing Committees***	
The Chairman of the LAC shall be nominated by the Director from the eligible faculty members of the Institute.	The Chairman of the LAC shall be nominated by the Director from the eligible faculty members of the Institute.	
CHAPTER V **Procedures of operation of the Senate Manual and the Procedures to be followed for Senate meetings**	**CHAPTER V** **Procedures of operation of the Senate Manual and the Procedures to be followed for Senate meetings**	
5.1 The procedures for nomination and operation specified in the Senate Manual shall be followed. Any inadequacy in the operation of the Manual shall be referred by the Secretary of the Senate to the Chairman of the Senate to effect proper changes, additions, and/or deletions. In case of any discrepancy or any dispute arising out in following the Senate Manual, the decision of the Chairman of the Senate shall be final and binding.	**5.1** The procedures for nomination and operation specified in the Senate Manual shall be followed. Any inadequacy in the operation of the Manual shall be referred by the Secretary of the Senate to the Chairman of the Senate to effect proper changes, additions, and/or deletions. In case of any discrepancy or any dispute arising out in following the Senate Manual, the decision of the Chairman of the Senate shall be final and binding.	
5.2 The provisions in the Senate Manual may be added to, amended or repealed at any meeting of the Senate, provided that the written notice of the proposed action has been sent to each member of the Senate at least two weeks prior to the meeting at which a particular provision is to be considered. Modification of the said provision shall require the approval of a majority of the members of the Senate present at the meeting in question and shall become effective on the date specified by the Senate.	**5.2** The provisions in the Senate Manual may be added to, amended or repealed at any meeting of the Senate, provided that the written notice of the proposed action has been sent to each member of the Senate at least two weeks prior to the meeting at which a particular provision is to be considered. Modification of the said provision shall require the approval of a majority of the members of the Senate present at the meeting in question and shall become effective on the date specified by the Senate.	
5.3 All meetings of the Senate shall be governed by the procedure specified below:	**3.1** All meetings of the Senate shall be governed by the procedure specified below:	
5.3.1 The members of the Senate/Secretaries of the Senate Committees should communicate to the Secretary of the Senate the items together with notes for inclusion in the agenda at least 15 days	**5.3.1** The members of the Senate/Secretaries of the Senate Committees should communicate to the Secretary of the Senate the items together with notes for inclusion in the agenda at least 15 days	

before the date of the meeting. Items submitted later than the above stipulated deadline should be submitted directly to the Chairman of the Senate. The reasons for the delay in submission must invariably be stated in a covering note. The inclusion of an item submitted late shall, however, be at the discretion of the Chairman. **5.3.2** The agenda papers should be in the hands of the members at least a week before the date of the meeting of the Senate. **5.3.3** The Chairman would invite comments from the members who have 'definite' ideas, about the proposal ahead of the meeting. Those, who have given comments, will be allowed to speak first on the Senate floor. **5.3.4** Once the members, who have sent written comments to the Chairman, have expressed their views on the floor of the Senate, the Chairman may like to invite additional comments. Thereafter, he shall summarize the discussion along with his own views on the matter. A decision on the item will then be arrived at and a resolution to this effect shall be passed. **5.3.5** A decision once taken should not normally be re-opened within one year from the date of the decision. However, the Chairman may move to re-consider the matter within one year under exceptional circumstances. **5.3.6** Normally, the order of business at regular meetings of the Senate shall be as follows : (i) Announcements by the Chairman; (ii) Confirmation of minutes of previous meeting; (iii) Follow-up action on previous decisions; (iv) Reports of the ECS, Boards and Committees of the Senate; (v) Unfinished business from the previous meeting; and (vi) New business. The order of business at any special or requisitioned meeting of the Senate shall be as follows : (i) The special business of the occasion; and (ii) Any other business that may be admitted by the Chairman of the Senate under special circumstances. **5.3.7** At any meeting of the Senate, the decisions must be formalized	before the date of the meeting. Items submitted later than the above stipulated deadline should be submitted directly to the Chairman of the Senate. The reasons for the delay in submission must invariably be stated in a covering note. The inclusion of an item submitted late shall, however, be at the discretion of the Chairman. **5.3.2** The agenda papers should be in the hands of the members at least a week before the date of the meeting of the Senate. **5.3.3** The Chairman would invite comments from the members who have 'definite' ideas, about the proposal ahead of the meeting. Those, who have given comments, will be allowed to speak first on the Senate floor. **5.3.4** Once the members, who have sent written comments to the Chairman, have expressed their views on the floor of the Senate, the Chairman may like to invite additional comments. Thereafter, he shall summarize the discussion along with his own views on the matter. A decision on the item will then be arrived at and a resolution to this effect shall be passed. **5.3.5** A decision once taken should not normally be re-opened within one year from the date of the decision. However, the Chairman may move to re-consider the matter within one year under exceptional circumstances. **5.3.6** Normally, the order of business at regular meetings of the Senate shall be as follows : (i) Announcements by the Chairman; (ii) Confirmation of minutes of previous meeting; (iii) Follow-up action on previous decisions; (iv) Reports of the ECS, Boards and Committees of the Senate; (v) Unfinished business from the previous meeting; and (vi) New business. The order of business at any special or requisitioned meeting of the Senate shall be as follows : (i) The special business of the occasion; and (ii) Any other business that may be admitted by the Chairman of the Senate under special circumstances. **5.3.7** At any meeting of the Senate, the decisions must be formalized	

by means of a consensus or an affirmative vote. Questions of order not covered in the Senate Manual shall be governed by rulings of the Chairman of the Senate at that time. Subsequently, the Senate may consider the matter and frame guidelines for future. **5.3.8** The Chairman of the Senate shall nominate the Experts as the nominees of the Senate to serve on the Selection Committees for various academic staff positions (Statute 13 (3)) from the panels of Experts approved by the Senate. The Senate shall consider the panels of experts in different specializations/ groups of a Department/ Centre or in interdisciplinary areas submitted by the Professorial Committees of the Departments/ Centres or the interdisciplinary Professorial Committees for the interdisciplinary areas constituted by the Chairman of the Senate, and may approve the panels with additions/ deletions. The panels of Experts shall be valid for a period of two years from the date of approval by the Senate or till such date a new panel is constituted. Appendix-I **Excerpts from the Institutes of Technology Act, 1961 which are relevant to the Senate Manual** ***Section 10*** *:* The following shall be the authorities of an Institute, namely : (a) a Board of Governors; (b) a Senate; and (c) such other authorities as may be declared by the Statutes to be the authorities of the Institute. ***Section 11****: The* Board of an Institute shall consist of the following persons, namely: - (a) the Chairman, to be nominated by the Visitor; (b) the Director, *ex officio;* (c) one person to be nominated by the Government of each of the States comprising the zone in which the Institute is situated, from among persons who, in the opinion of that Government, are technologists or industrialists of repute; (d) four persons having special knowledge or practical experience in respect of education, engineering or science to be nominated by the Council; and	by means of a consensus or an affirmative vote. Questions of order not covered in the Senate Manual shall be governed by rulings of the Chairman of the Senate at that time. Subsequently, the Senate may consider the matter and frame guidelines for future. **5.3.8** The Chairman of the Senate shall nominate the Experts as the nominees of the Senate to serve on the Selection Committees for various academic staff positions (Statute 13 (3)) from the panels of Experts approved by the Senate. The Senate shall consider the panels of experts in different specializations/ groups of a Department/ Centre or in interdisciplinary areas submitted by the Professorial Committees of the Departments/ Centres or the interdisciplinary Professorial Committees for the interdisciplinary areas constituted by the Chairman of the Senate, and may approve the panels with additions/ deletions. The panels of Experts shall be valid for a period of two years from the date of approval by the Senate or till such date a new panel is constituted. Appendix-I **Excerpts from the Institutes of Technology Act, 1961 which are relevant to the Senate Manual** ***Section 10*** *:* The following shall be the authorities of an Institute, namely : (a) a Board of Governors; (b) a Senate; and (c) such other authorities as may be declared by the Statutes to be the authorities of the Institute. ***Section 11****: The* Board of an Institute shall consist of the following persons, namely: - (a) the Chairman, to be nominated by the Visitor; (b) the Director, *ex officio;* (c) one person to be nominated by the Government of each of the States comprising the zone in which the Institute is situated, from among persons who, in the opinion of that Government, are technologists or industrialists of repute; (d) four persons having special knowledge or practical experience in respect of education, engineering or science to be nominated by the Council; and	

(e) two professors of the Institute, to be nominated by the Senate. *Explanation :* In this section, the expression "zone" means a zone as for the time being demarcated by the All India Council for Technical Education for the purposes of this Act. *In case of IIT, Roorkee, the 'zone' comprises of the States of Uttarakhand, Haryana and Himachal Pradesh (vide MHRD letter F.No. 7-18/2001-TS.I dated 17th January 2002).* ***Section 12(3)*:** The term of Office of a member nominated under Clause (e) of Section 11 shall be two years from the 1st day of January of the year in which he is nominated. ***Section 14*:**. The Senate of each Institute shall consist of the following persons, namely:- (a) the Director, *ex officio,* who shall be the Chairman of the Senate; (b) the Deputy Director, *ex officio,* (c) the professors appointed or recognized as such by the Institute for the purpose of imparting instructions in the Institute; (d) three persons, not being employees of the Institute, to be nominated by the Chairman in consultation with the Director, from among educationists of repute, each from the fields of science, engineering and humanities; and (e) such other members of the staff as may be laid down in the Statutes. ***Section 15*** *:* Subject to the provisions of this Act, the Statutes and the Ordinances, the Senate of an Institute shall have the control and general regulation, and be responsible for the maintenance of standards of instruction, education and examination in the Institute and shall exercise such other powers and perform such other duties as may be conferred or imposed upon it by Statutes. ***Section 26****:* Subject to the provisions of this Act, the Statutes may provide for all or any of the following matters, namely:- (a) the conferment of honorary degrees; (b) the formation of departments of teaching; (c) the fees to be charged for courses of study in the Institute and for admission to the examinations of degrees and diplomas of the Institute;	(e) two professors of the Institute, to be nominated by the Senate. *Explanation :* In this section, the expression "zone" means a zone as for the time being demarcated by the All India Council for Technical Education for the purposes of this Act. *In case of IIT, Roorkee, the 'zone' comprises of the States of Uttarakhand, Haryana and Himachal Pradesh (vide MHRD letter F.No. 7-18/2001-TS.I dated 17th January 2002).* ***Section 12(3)*:** The term of Office of a member nominated under Clause (e) of Section 11 shall be two years from the 1st day of January of the year in which he is nominated. ***Section 14*:**. The Senate of each Institute shall consist of the following persons, namely:- (a) the Director, *ex officio,* who shall be the Chairman of the Senate; (b) the Deputy Director, *ex officio,* (c) the professors appointed or recognized as such by the Institute for the purpose of imparting instructions in the Institute; (d) three persons, not being employees of the Institute, to be nominated by the Chairman in consultation with the Director, from among educationists of repute, each from the fields of science, engineering and humanities; and (e) such other members of the staff as may be laid down in the Statutes. ***Section 15*** *:* Subject to the provisions of this Act, the Statutes and the Ordinances, the Senate of an Institute shall have the control and general regulation, and be responsible for the maintenance of standards of instruction, education and examination in the Institute and shall exercise such other powers and perform such other duties as may be conferred or imposed upon it by Statutes. ***Section 26****:* Subject to the provisions of this Act, the Statutes may provide for all or any of the following matters, namely:- (a) the conferment of honorary degrees; (b) the formation of departments of teaching; (c) the fees to be charged for courses of study in the Institute and for admission to the examinations of degrees and diplomas of the Institute;	

(d) the institution of fellowships, scholarship exhibitions, medals and prizes; (e) the term of office and the method of appointment of officers of the Institute; (f) the qualifications of teachers of the Institute (g) the classification, the method of appointment and the determination of the terms and conditions of service of teachers and other staff of the Institute; (h) the constitution of pension, insurance and provident funds for the benefit of the officers, teachers and other staff of the Institute; (i) the constitution, powers and duties of the authorities of the Institute; (j) the establishment and maintenance of halls and hostels; (k) the conditions of residence of students of the Institute and the levying of fees for residence in the halls and hostels and of other charges; (l) the manner of filling vacancies among members of the Board; (m) the allowances to be paid to the Chairman and members of the Board; (n) the authentication of the orders and decisions of the Board; (o) the meeting of the Board, the Senate, or any Committee, the quorum at such meetings and the procedure to be followed in the conduct of their business; (p) any other matter which by this Act is to be or may be prescribed by the Statutes. **Section 27**: (1) The first Statutes of each Institute shall be framed by the Council with the previous approval of the Visitor and a copy of the same shall be laid, as soon as may be, before each House of Parliament. (2) The Board may, from time to time, make new or additional Statutes or may amend or repeal the Statutes in the manner provided hereafter in this section. (3) Every new Statute or addition to the Statutes or any amendment	(d) the institution of fellowships, scholarship exhibitions, medals and prizes; (e) the term of office and the method of appointment of officers of the Institute; (f) the qualifications of teachers of the Institute (g) the classification, the method of appointment and the determination of the terms and conditions of service of teachers and other staff of the Institute; (h) the constitution of pension, insurance and provident funds for the benefit of the officers, teachers and other staff of the Institute; (i) the constitution, powers and duties of the authorities of the Institute; (j) the establishment and maintenance of halls and hostels; (k) the conditions of residence of students of the Institute and the levying of fees for residence in the halls and hostels and of other charges; (l) the manner of filling vacancies among members of the Board; (m) the allowances to be paid to the Chairman and members of the Board; (n) the authentication of the orders and decisions of the Board; (o) the meeting of the Board, the Senate, or any Committee, the quorum at such meetings and the procedure to be followed in the conduct of their business; (p) any other matter which by this Act is to be or may be prescribed by the Statutes. **Section 27**: (1) The first Statutes of each Institute shall be framed by the Council with the previous approval of the Visitor and a copy of the same shall be laid, as soon as may be, before each House of Parliament. (2) The Board may, from time to time, make new or additional Statutes or may amend or repeal the Statutes in the manner provided hereafter in this section. (3) Every new Statute or addition to the Statutes or any amendment	

or repeal of a Statute shall require the previous approval of the Visitor who may assent thereto or withhold assent or remit it to the Board for consideration. (4) A new Statute or a Statute amending or repealing an existing Statute shall have no validity unless it has been assented to by the Visitor. ***Section 28*** *:* Subject to the provisions of this Act and the Statutes, the Ordinances of each Institute may provide for all or any of the following matters, namely :- (a) the admission of the students to the Institute; (b) the courses of study to be laid down for all degrees and diplomas of the Institute; (c) the conditions under which students shall be admitted to the degree or diploma courses and to the examinations of the Institute, and shall be eligible for degrees and diplomas; (d) the conditions of award of the fellowships, scholarships, exhibitions, medals and prizes; (e) the conditions and mode of appointment and duties of examining bodies, examiners and moderators; (f) the conduct of examinations; (g) the maintenance of discipline among the students of the Institute; and (h) any other matter which by this Act or the Statutes is to be or may be provided for by the Ordinances. ***Section 29*** (1) Save as otherwise provided in this section Ordinances shall be made by the Senate. (2) All Ordinances made by the Senate shall have effect from such date as it may direct, but every Ordinance so made shall be submitted as soon as may be, to the Board and shall be considered by the Board at its next meeting. (3) The Board shall have power by resolutions to modify or cancel any such Ordinance and such Ordinance shall from the date of such resolution stand modified accordingly or cancelled, as the case may	or repeal of a Statute shall require the previous approval of the Visitor who may assent thereto or withhold assent or remit it to the Board for consideration. (4) A new Statute or a Statute amending or repealing an existing Statute shall have no validity unless it has been assented to by the Visitor. ***Section 28*** *:* Subject to the provisions of this Act and the Statutes, the Ordinances of each Institute may provide for all or any of the following matters, namely :- (a) the admission of the students to the Institute; (b) the courses of study to be laid down for all degrees and diplomas of the Institute; (c) the conditions under which students shall be admitted to the degree or diploma courses and to the examinations of the Institute, and shall be eligible for degrees and diplomas; (d) the conditions of award of the fellowships, scholarships, exhibitions, medals and prizes; (e) the conditions and mode of appointment and duties of examining bodies, examiners and moderators; (f) the conduct of examinations; (g) the maintenance of discipline among the students of the Institute; and (h) any other matter which by this Act or the Statutes is to be or may be provided for by the Ordinances. ***Section 29*** (1) Save as otherwise provided in this section Ordinances shall be made by the Senate. (2) All Ordinances made by the Senate shall have effect from such date as it may direct, but every Ordinance so made shall be submitted as soon as may be, to the Board and shall be considered by the Board at its next meeting. (3) The Board shall have power by resolutions to modify or cancel any such Ordinance and such Ordinance shall from the date of such resolution stand modified accordingly or cancelled, as the case may	

be. Appendix –II **Excerpts from the Statutes of I.I.T., Roorkee which have relevance to the Senate Manual** ***Statute 5 — The Senate*** In addition to the persons mentioned in Section 14 of the Act, the following shall be the members of the Senate, namely: - (a) The Heads of the Departments/ Academic Centres/ Schools other than Professors, as are not members of the Senate; (b) the Deans and Associate Deans other than Professors, as are not members of the Senate; (c) the Librarian of the Institute; (d) One Chief Warden by rotation to be nominated by the Director for a period of one year; (e) not more than six other members of the academic staff for their special knowledge appointed by the Chairman after consultation with the Director for such period as may be specified by the Chairman. (2) Subject to the provisions of the Act, the Senate shall have the power to:- (a) frame and revise curricula and syllabi for courses of studies for the various Departments/ Academic Centres; (b) make arrangements for the conduct of examinations; appoint examiners, moderators, tabulators and the like. (c) declare the results of the examinations or to appoint committees or officers to do so and to make recommendations to the Board regarding conferment or grant of degrees, diplomas and other academic distinctions or titles; (d) appoint Advisory Committees or Expert Committees or both for the Departments and the Academic Centres of the Institute to make recommendations on academic matters connected with the working of the Department/ Academic Centre. The Head of the Department	be. Appendix –II **Excerpts from the Statutes of I.I.T., Roorkee which have relevance to the Senate Manual** ***Statute 5 — The Senate*** In addition to the persons mentioned in Section 14 of the Act, the following shall be the members of the Senate, namely: - (a) The Heads of the Departments/ Academic Centres/ Schools other than Professors, as are not members of the Senate; (b) the Deans and Associate Deans other than Professors, as are not members of the Senate; (c) the Librarian of the Institute; (d) One Chief Warden by rotation to be nominated by the Director for a period of one year; (e) not more than six other members of the academic staff for their special knowledge appointed by the Chairman after consultation with the Director for such period as may be specified by the Chairman. (2) Subject to the provisions of the Act, the Senate shall have the power to:- (a) frame and revise curricula and syllabi for courses of studies for the various Departments/ Academic Centres; (b) make arrangements for the conduct of examinations; appoint examiners, moderators, tabulators and the like. (c) declare the results of the examinations or to appoint committees or officers to do so and to make recommendations to the Board regarding conferment or grant of degrees, diplomas and other academic distinctions or titles; (d) appoint Advisory Committees or Expert Committees or both for the Departments and the Academic Centres of the Institute to make recommendations on academic matters connected with the working of the Department/ Academic Centre. The Head of the Department	

concerned shall act as convenor of such Committees; (e) appoint Committees from amongst the members of the Senate, other teachers of the Institute and experts from outside to advise on such specific academic matters as may be referred to any such committee by the Senate; (f) consider the recommendations of the Advisory Committees attached to various Departments and that of Expert and other Committees and take such action (including the making of recommendations to the Board) as circumstances of each case may require; (g) make periodical review of the activities of the Departments and take appropriate action (including the making of recommendations to the Board); (h) supervise the working of the Library; (i) promote research within the Institute and require reports on such research from the persons engaged thereon; (j) provide for the inspection of the classes and the Halls of Residence in respect of the instructions and discipline therein, supervise the co-curricular activities of the students of the Institute and submit reports thereon to the Board. (k) award stipends, scholarships, fellowships, medals and prizes and make other awards in accordance with the Ordinances and such conditions as may be attached to the awards; (l) make recommendations to the Board with regard to : (i) the creation of posts of the academic staff and the abolition thereof; and (ii) the emoluments and duties attached to such posts. (m) make recommendations to the Board with regard to (i) the establishment of the Departments/Centres/Schools/Service Centres and the abolition thereof, and (ii) the allocation of academic and other staff to such Academic Departments/ Centres/ Schools/ Service Centres. (n) provide support to other technical institutions in furtherance of their academic standards; (o) outreach through distance learning mode to enhance the academic and research productivity of the Institute.	concerned shall act as convenor of such Committees; (e) appoint Committees from amongst the members of the Senate, other teachers of the Institute and experts from outside to advise on such specific academic matters as may be referred to any such committee by the Senate; (f) consider the recommendations of the Advisory Committees attached to various Departments and that of Expert and other Committees and take such action (including the making of recommendations to the Board) as circumstances of each case may require; (g) make periodical review of the activities of the Departments and take appropriate action (including the making of recommendations to the Board); (h) supervise the working of the Library; (i) promote research within the Institute and require reports on such research from the persons engaged thereon; (j) provide for the inspection of the classes and the Halls of Residence in respect of the instructions and discipline therein, supervise the co-curricular activities of the students of the Institute and submit reports thereon to the Board. (k) award stipends, scholarships, fellowships, medals and prizes and make other awards in accordance with the Ordinances and such conditions as may be attached to the awards; (l) make recommendations to the Board with regard to : (i) the creation of posts of the academic staff and the abolition thereof; and (ii) the emoluments and duties attached to such posts. (m)make recommendations to the Board with regard to (i) the establishment of the Departments/Centres/Schools/Service Centres and the abolition thereof, and (ii) the allocation of academic and other staff to such Academic Departments/ Centres/ Schools/ Service Centres. (n) provide support to other technical institutions in furtherance of their academic standards; (o) outreach through distance learning mode to enhance the academic and research productivity of the Institute.	

(3) The Senate shall meet as often as necessary but not less than four times during a calendar year. (4) Meetings of the Senate shall be convened by the Chairman of the Senate either on his own initiative or on a requisition signed by not less than 20% of the members of the Senate. The requisitioned meeting shall be a special meeting to discuss only those items of agenda for which requisition is made. The requisitioned meeting shall be convened by the Chairman of the Senate on date and time convenient to him within 15 days of the notice given for such a requisition. (5) One-third of the total number of members of the Senate shall form a quorum for a meeting of the Senate. (6) The Director, if present, shall preside at every meeting of the Senate. In his absence, the Deputy Director shall preside and in the absence of both the Director and the Deputy Director, the senior-most of the Deans present shall preside at the meeting. In case none of the Deans are present, the senior most of the Professors present shall preside at the meeting. (7) A written notice of every meeting, together with the agenda, shall be circulated by the Registrar to the members of the Senate at least a week before the meeting. The Chairman of the Senate may permit inclusion of any item for which due notice could not be given. (8) Notwithstanding the provisions of sub-statute (7), the Director may call an emergency meeting of the Senate at short notice to consider urgent special issues. (9) The ruling of the Chairman of the Senate in regard to all questions of procedure shall be final. (10) The minutes of the proceedings of a meeting of the Senate shall be drawn up by the Registrar with the approval of the Chairman of the Senate and circulated to all the members of the Senate present in India. Provided that any such minute shall not be circulated if the Senate considers such circulation prejudicial to the interests of the Institute. The minutes, along with amendments, if any suggested, shall be placed for confirmation at the next meeting of the Senate. After the minutes are confirmed and signed by the Chairman	(3) The Senate shall meet as often as necessary but not less than four times during a calendar year. (4) Meetings of the Senate shall be convened by the Chairman of the Senate either on his own initiative or on a requisition signed by not less than 20% of the members of the Senate. The requisitioned meeting shall be a special meeting to discuss only those items of agenda for which requisition is made. The requisitioned meeting shall be convened by the Chairman of the Senate on date and time convenient to him within 15 days of the notice given for such a requisition. (5) One-third of the total number of members of the Senate shall form a quorum for a meeting of the Senate. (6) The Director, if present, shall preside at every meeting of the Senate. In his absence, the Deputy Director shall preside and in the absence of both the Director and the Deputy Director, the senior-most of the Deans present shall preside at the meeting. In case none of the Deans are present, the senior most of the Professors present shall preside at the meeting. (7) A written notice of every meeting, together with the agenda, shall be circulated by the Registrar to the members of the Senate at least a week before the meeting. The Chairman of the Senate may permit inclusion of any item for which due notice could not be given. (8) Notwithstanding the provisions of sub-statute (7), the Director may call an emergency meeting of the Senate at short notice to consider urgent special issues. (9) The ruling of the Chairman of the Senate in regard to all questions of procedure shall be final. (10) The minutes of the proceedings of a meeting of the Senate shall be drawn up by the Registrar with the approval of the Chairman of the Senate and circulated to all the members of the Senate present in India. Provided that any such minute shall not be circulated if the Senate considers such circulation prejudicial to the interests of the Institute. The minutes, along with amendments, if any suggested, shall be placed for confirmation at the next meeting of the Senate. After the minutes are confirmed and signed by the Chairman	

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