भारतीय प्रौद्योगिकी संस्थान रूड़की
रूड़की – २४७ ६६७ (भारत)

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

सीनेट की उनहत्तरवीं बैठक हेतु कार्य सूची

AGENDA FOR THE 69th MEETING OF THE SENATE

बैठक सं0	:	उनहत्तरवीं
MEETING No.	:	**69th**
स्थान	:	सीनेट हॉल, भा0प्रौ0सं0रूड़की
VENUE	:	**Senate Hall, IIT Roorkee**
दिनांक	:	28 जुलाई 2017
DATE	:	**28th July 2017**
समय	:	3.30 बजे अपरान्ह
TIME	:	**3.30 P.M.**

भारतीय प्रौद्योगिकी संस्थान रूड़की
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
रूड़की 247 667
ROORKEE – 247 667

A G E N D A /कार्यसूची

Item No. / मुद्दा सं0	Particulars /विवरण	Page(s)/ पृष्ठ
69.1	02.03.2017 को आयोजित हुई सीनेट की 68वी बैठक के कार्यवृत्त की पुष्टि करना। To confirm the minutes of the 68th meeting of the Senate held on 02.03.2017.	1
69.2	02.03.2017 को आयोजित हुई सीनेट की 68वी बैठक में लिए गए निर्णयों के कियान्वयन हेतु की गई कार्रवाई की रिपोर्ट प्राप्त करना। To receive a report on the actions taken to implement the decisions taken by the Senate in its 68th meeting held on 02.03.2017.	2-15
69.3	30 जून तक डिजरटेशन प्रस्तुत करने या डिजरटेशन से संबंधित किसी भी कार्य के लिए, जो भी पहले हो, परिसर में रहने वाले एम. टेक छात्र को फैलोशिप के भुगतान पर विचार करना। To consider the payment of Fellowship to M.Tech. students after submission of dissertation upto June 30th or till the period student stays in the campus for any work related to dissertation, whichever is earlier.	16
69.4	दक्षता की सूची में सिनेमाई अनुभाग को शामिल करने के लिए डीओएसडब्लयू से प्राप्त प्रस्ताव पर विचार करना। To consider the proposal received from DOSW for inclusion of Cinematic Section in the list of proficiencies.	17
69.5	मुख्य सलाहकार, होबीज क्लब से प्राप्त क्लब के कुछ वर्गो के रिनेमिंग करने पर विचार करना। To consider the renaming of some sections of the Hobbies Club received from Chief Advisor, Hobbies Club.	18

69.6	अलग तरह से सक्षम विद्यार्थियों के पाठ्यक्रम के मूल्यांकन मुददों पर विचार करना। To consider course evaluation issues of differently abled students.	19
69.7	सी0जी0पी0ए0 से प्रतिशत में परिवर्तन का वर्तमान फॉर्मूला 5.00 से उपलब्ध होने के कारण जिन छात्रों का सीजीपीए 4.00 से 5.00 के बीच है उनके लिए परिवर्तन फॉर्मूले पर विचार करना। To consider the percentage formula for the students who have CGPA between 4.00 - 5.00 because the converted formula is available from CGPA 5.00 and onward.	20
69.8	विभिन्न विभागों/ केन्द्रों के संशोधित पाठफयक्रम और अध्ययन विषयवस्तु को स्वीकृत करने के लिए सीनेट द्वारा शक्ति को प्रतिनिधित्व पर विचार करना। To consider to delegate the power by Senate for approving the revised curricula and syllabi of courses of studies for various departments/Centres.	21
69.9	सीनेट मद सं0 68.10 के निर्णय के अनुसार एमटेक से पीएचडी में स्विच ओवर कार्यक्रम की स्वीकृति में एमटेक कार्यक्रम चल रहे केन्द्रों को शामिल किये जाने पर विचार करना। To consider the decision taken vide Senate Item No. 68.10 with respect to switch-over from M.Tech. to Ph.D. programme: To include centres running M.Tech. programme.	22
69.10	चार विभागों द्वारा अनुशंसित अनुसंधान क्षेत्रों पर विचार करना। To consider the Research Areas recommended by Four Departments.	23
69.11	इलेक्टानिक्स और संचार इंजीनियरिंग विभाग में पीएचडी में प्रवेश के लिए कम्पयुटर साइंस प्रोग्राम में बीटेक + एमटेक पात्रता को अनुमति देने पर विचार करना। To consider for allowing B.Tech. + M.Tech. in Computer Science programme for eligibility of Ph.D. admission in the Department of Electronics & Communication Engineering.	24
69.12	पीएचडी प्रोग्राम में उम्मीदवारी के लिए अवधि बढ़ानें के प्रस्ताव पर विचार करना। To consider the proposal of increasing the duration for candidacy in Ph.D. programme.	25

69.13	कंसल्टेंसी परियोजना में आरएंडडी कम्पोनेंट में काम करने वाले परोंजक्ट फैलो के पीएचडी में प्रवेश पर विचार करना। To consider the admission of Project Fellows, working in a consultancy project having R&D component as a Ph.D. research scholar.	26
69.14	सीएसआईआर और युजीसी फैलो, जो पीएचडी उम्मीदवार के लिए मूल्यांकन समिति के पुर्नगठन पर विचार करना। To consider re-constitution of the Evaluation Committee for CSIR and UGC fellows who enroll themselves as Ph.D. candidate.	27
69.15	आईआईटीआर एसिस्टेंटशिप के अलावा राष्ट्रीय फडिंग योजनाओं के अर्न्तगत पीएचडी में प्रवेश के लिए रोलिगं विज्ञापन के प्रावधान एवं उसके बाद की प्रक्रिया पर विचार करना। To consider provision of rolling advertisement for admitting Ph.D. candidates under national funding schemes other than IITR Assistantship and procedure thereafter.	28
69.16	कम्पयूटर साईंस और इंजिनियरिग विभाग द्वारा प्रस्तावित सीएसई में पीएचडी प्रवेश पर निम्न लिखित नये मानदंडों पर विचार करना। 1. कम्पयुटर साईंस और इंजिनियरिंग में एमटेक/एमई/सोफटवेयर इंजिनियरिंग या समकक्ष । 2. विद्युत इंजिनियरिंग में एमटेक/एमई/इलेक्ट्रोनिक्स और संचार इंजिनियरिंग या समकक्ष। 3. कम्पयुटर साईंस और इंजिनियरिंग में एमटेक/एमई/इंफोरमेशन टैक्नोलोजी या समकक्ष । उपयुर्क्त 1,2,और 3 में से कोई एक और कम्पयुटर साईंस/इंफोरमेशन टैक्नोलोजी में गेट/यूजीसी नेट/सीएसआईआर नेट में राष्ट्रीय लेवल स्नातक प्रवेश परीक्षा पास की हो । To consider following new criteria for Ph.D. admission in the CSE as proposed by the Department of Computer Science & Engineering:- (i) M.Tech./ME in Computer Science and Engineering/ Information Technology/Software Engineering or equivalent. (ii) M.Tech./ME in Electrical Engineering/Electronics and Communications Engineering or equivalent. (iii) B.Tech./BE in Computer Science and Engineering/Information Technology or equivalent.	29

	Either one of the above (i), (ii) and (iii) and qualified national level graduate entrance test: GATE/UGC-NET/CSIR-NET in Computer Science/Information Technology.	
69.17	अगर परीक्षक आईआईटी रूड़की की यात्रा करने की स्थिति में नही है तो पीएचडी वायवा–वोसी स्काईप के माध्यम से कराने पर विचार करना। To consider conduct of viva-voce of Ph.D. candidate through Skype under conditions that examiner is not in a position to travel to IITR.	30
69.18	राष्ट्रीय फंडिगं योजना के तहत महिला वैज्ञानिक के रूप में कार्य करने वाली उम्मीदवार के पीएचडी में प्रवेश पर विचार करना। To consider the admission of candidate for Ph.D. working as Woman scientist under national funding scheme.	31
69.19	पीएचडी डिग्री के संबंध में शोध क्षेत्र का उल्लेख करने वाले प्रमाण पत्र पर विचार करना। To consider the certificate mentioning research area with regard to Ph.D. Degree.	32-36

Item No. 69.1: To confirm the minutes of the 68th meeting of the Senate held on 02.03.2017.

The minutes of the 68th meeting of the Senate held on 02.03.2017 were circulated to the members vide e-mail dated 31.03.2017.

The Senate may consider confirming the said minutes.

Item No.69.2: To receive a report on the actions taken to implement the decisions taken by the Senate in its 68th meeting held on 2nd March 2017.

The minutes of the 68th meeting of the Senate held on 2nd March 2017, were circulated to the members vide e-mail dated 31.03.2017. The status of actions taken to implement the decisions of the Senate are as under:

Item No.	Reference to the Senate minutes	Abstract of the Minutes	Status of action taken
68.3	Views/comments with reasons received from the various Heads of Departments regarding completion of degree requirement of B.Tech. in 3½ years instead of 4 years - fees in advance.	The Senate considered the recommendations of IAPC regarding completion of degree requirement of B.Tech. in 3½ years instead of 4 years and accepted the following: (a) The students having CGPA more than 9.00 at the end of the 2nd year may be considered to be allowed to complete the degree requirement in 3½ years. (b) There will be no rescheduling of classes by any department. (c) The project duration will not be relaxed. The student has to start the project in 3rd year spring semester to complete it in one year. (d) The request to complete the degree in 3½ years will be considered on the merit of the case by the Dean (Academics) on the recommendation of HoD. It was also decided that this provision of completing the degree requirements, one semester before, be extended to other programmes, wherever possible.	Notification No. Acd/4615/UG-15 dated 11th April 2017 has been issued.

68.4	Correction in admission criteria for M.Tech. (Bioprocess Engineering) as proposed by Biotechnology Department .	The Senate considered the correction in admission criteria for M.Tech. (Bioprocess Engineering) as recommended by IAPC and decided to approve the same with minor corrections.	Notification No. Acd/4610/UG-15 dated 10th April 2017 has been issued.
68.5	Proposal of giving same rank to students having same SGPA for change of branch.	The Senate considered the recommendation of IAPC of giving same rank to students having same SGPA for change of branch and did not accept the same.	Notification No. Acd/4611/UG-15 dated 11th April 2017 has been issued.
68.6	Proposal of students not to grade NCC and other proficiencies.	The Senate considered the recommendation of IAPC not to include grade of NCC and other proficiencies in CGPA calculation and did not accept the same.	Notification No. Acd/4612/UG-15 dated 11th April 2017 has been issued.
68.7	Policy for awarding 'O' grade.	The Senate considered the recommendation of IAPC regarding policy of awarding 'O' grade and after discussion it was decided that a committee be constituted to review the grading system.	A committee under the Chairmanship of Prof. Himanshu Joshi was constituted to review the whole grading system regulations vide Office Memo No. Acd/5242/Misc. 2017 dated 12th June 2017.
68.8	Research Areas recommended by various Departments/ Centres to be printed in the Ph.D. degree.	The Senate considered the Research Areas as proposed by different departments/centres and recommended by IRC, to be printed in the Ph.D. degree. After deliberations decided to approve the same with minor corrections. Further, decided that the research areas of rest of the departments/centres be	Notification No. Acd/4613/UG-15 dated 11th April 2017 has been issued.

		considered in the next meeting. It was also decided that Dean (Academics) will propose 2 to 3 options of Ph.D. degree formats for the consideration of the Senate.	
68.9	Minor change in short-listing candidates for Ph.D. admission.	The Senate considered the minor changes as recommended by IRC in short-listing candidates for Ph.D. admission and did not accept the same.	No action is required.
68.10	Proposal of extending M.Tech. to Ph.D. switchover programme to every department.	The Senate considered the recommendation of IAPC of extending switchover from M.Tech. to Ph.D. programme to every department having M.Tech. programme and decided to approve the same.	Notification No. Acd/4614/UG-15 dated 11th April 2017 has been issued.
68.11	Proposal from Department of Management Studies to include the clause of "need of full time candidature" in the rules of outside Ph.D. supervision.	The Senate considered the proposal from Department of Management Studies and the recommendation of IAPC to include the clause of "Full-Time Ph.D. students of other Institutes/Universities" in the guidelines for supervision of Ph.D. students of other Institutes/ Universities. During discussion several other related issues were raised by the members and after discussion the proposal was not accepted.	No action is required.
68.12	Modified educational qualification for admission to Ph.D. Programmes at Saharanpur campus.	The Senate considered the proposal of Saharanpur campus and the recommendations of IRC regarding modified educational qualifications for admission to Ph.D. programmes at Saharanpur campus and accepted the same. It was also decided that faculty members of HSS, ECE and MS will be included in the Ph.D. admission selection committee of respective departments at Roorkee campus.	Notification No. Acd/4616/UG-15 dated 11th April 2017 has been issued
68.13	Minor corrections in the Ph.D. Ordinances & Regulations regarding	The members were informed that some changes were approved by the then Director as Chairman, Senate regarding thesis evaluation. During discussion, few related	A committee under the Chairmanship of

	thesis evaluation.	issues were raised by the members. After discussion, it was decided that no further changes be made and the entire matter be reviewed by a Committee.	Prof. M. Shrikhande has been constituted vide Office Memo No. Acd/5082/Misc. 2017 dated 12th May 2017 to review the Ph.D. Ordinances & Regulations.
68.14 - 51 -	Revised curriculum structure of M.Tech. programmes as proposed by the Department of Physics.	The Senate considered the revised curriculum structure of existing PG programme and new PG programme as proposed by the Department of Physics and recommended by IAPC and decided to approve the following: 1. M.Tech. (Solid State Electronics Materials) - Revised 2. M.Tech. (Photonics) -New Further decided that the eligibility for the admission in these programmes will be as below: M.Sc. (Physics/Electronics/Applied Physics/Photonics/ Engineering Physics) B.Tech.(Engineering Physics/Electronics/Communication/ Electrical/ Instrumentation/Materials/Metallurgy/ Nanotechnology)	Notification No. Acd/4617/UG-15 dated 11th April 2017 has been issued

68.15	Proposal of MHRD to join NATIONAL ACADEMIC DEPOSITORY.	The Senate considered the proposal of MHRD to join NATIONAL ACADEMIC DEPOSITORY as recommended by IAPC and decided to approve the same.	Notification No. Acd/4618/UG-15 dated 11th April 2017 has been issued
68.16	Letter from Department of Physics seeking corrigendum saying that B.Tech. (Engineering Physics) programme involves multi-disciplinary courses and coordinated by the Department of Physics.	The Senate considered the request from Department of Physics seeking amendment in UG Ordinances and Regulations regarding B.Tech. (Engineering Physics) programme as a programme of the Department of Physics. After discussion it was decided that this did not need any change in the UG Ordinances & Regulations as even now there are few electives taught by engineering departments. In future, with the increase of faculty in engineering departments, core courses may also be shared by engineering departments.	Notification No. Acd/4619/UG-15 dated 11th April 2017 has been issued
68.17	Proposal of Department of Bio-Technology for exchange of course No. BTN-511 and BTN-524 of M.Sc. Biotechnology programme from autumn semester to spring semester.	The Senate considered the request of Department of Bio-Technology and the recommendation of IAPC for exchange of course BTN-511: Computer Applications from Autumn Semester to Spring Semester and BTN-524: Communication from Spring Semester to Autumn Semester of M.Sc. Biotechnology 1st Year and decided to approve the same.	Notification No. Acd/4620/UG-15 dated 11th April 2017 has been issued
68.18	New and revised courses proposed by Centre of Excellence in Disaster Mitigation & Management	The Senate considered the syllabi of the following programme core courses and electives as proposed by the Centre of Excellence in Disaster Mitigation and Management and recommended by IAPC. It was decided to approve the same: 1. DMN-610: Industrial Disasters and Safety.	Notification No. Acd/4621/UG-15 dated 11th April 2017 has been issued

<table>
<tr><td></td><td></td><td>2. DMN-503: Managerial and Legal Aspects of Disasters
3. DMN-608: Man-made and Biological Disasters

It was further decided that an agenda item be brought in the next Senate to delegate this power of the Senate to IAPC.</td><td></td></tr>
<tr><td>68.19

- 7 -</td><td>Recommendations of DAPC of Electrical Engineering Department for exchange of course EEN-211 with the course MT-105 of II Year and the syllabi of new programme electives.</td><td>The Senate considered the proposal of Department of Electrical Engineering as recommended by IAPC of exchanging the courses of B.Tech. (Electrical) 2nd Year as below and decided to approve the same:
<table><tr><td>EEN-211: Control Systems</td><td>Autumn Semester to Spring Semester</td></tr><tr><td>MTN-105: Electrical and Electronic Materials</td><td>Spring Semester to Autumn Semester</td></tr></table>
The Senate also considered the syllabi of the following programme electives as proposed by the Department of Electrical Engineering and recommended by IAPC and decided to approve the same:

1. EEN-657: Digital Control of Power Converters
2. EEN-740: Communication Techniques in Smart Grid
3. EEN-741: Control and Management of Smart Grid
4. EEN-742: Power Converter Topologies in Smart Grid</td><td>Notification No. Acd/4622/UG-15 dated 11th April 2017 has been issued</td></tr>
<tr><td>68.20</td><td>Subjects with revised codes received/proposed by the Department of Humanities</td><td>The Senate considered the revised syllabus of the core course and the syllabi of pre-Ph.D. courses as proposed by the Department of Humanities & Social Sciences and</td><td>Notification No. Acd/4623/UG-15 dated 11th April</td></tr>
</table>

- 8 -	& Social Sciences.	recommended by IAPC. The Senate decided to approve the following: 1. HSN-501: Technical Communication 2. HSN-902: Understanding Personality 3. HSN-903: Advances in Social Psychology 4. HSN-906: Advances in Development Economics 5. HSN-908: Research Methodology in Social Sciences 6. HSN-910: Econometric Methods 7. HSN-911: Research Methodology in Language & Literature 8. HSN-912: Principles of Literature 9. HSN-913: The Art of Fiction 10. HSN-914: Poetry: Major Trends and Critical Appreciation 11. HSN-916: Sociological Theories 12. HSN-917: Sociology of Indian Society 13. HSN-918: Sociology of Science	2017 has been issued
68.21	Programme Elective Courses proposed by the Department of Electrical Engineering under category-1 and category-2.	The Senate considered the following programme electives as proposed by the Department of Electrical Engineering under Category-1 and Category-2 and recommended by IAPC and decided to approve the same: **Category-1:** 1. EEN-365: Numerical Methods for Electrical Engineering 2. EEN-366: Computational Electromagnetics	Notification No. Acd/4624/UG-15 dated 11th April 2017 has been issued

		Category-2: 1. EEN-672: Smart Grid 2. EEN-673: Power Plant Engineering	
68.22	The syllabi of the programme elective courses for the students of MBA proposed by the Department of Management Studies.	The Senate considered the syllabi of the following programme elective courses for the students of MBA as proposed by the Department of Management Studies and recommended by IAPC. The Senate decided to approve the same: 1. BMN-685: International Economics 2. BMN-686: Investment Valuation 3. BMN-687: Retail Management	Notification No. Acd/4625/UG-15 dated 11th April 2017 has been issued
68.23	Correction in the syllabi of MAN-903: Theory of Differential Equations as L-3 T-0 P-0 of 3 credits in place of L-3 T-1 P-0 of 4 credits as approved by the Senate.	The Senate considered the following modifications suggested by the Department of Mathematics and recommended by IAPC for the course MAN-903: Theory of Differential Equations and decided to approve the same. The modified credits and L-T-P loading are given below: Credits : 4 Load : L-3 T-1 P-0	Notification No. Acd/4626/UG-15 dated 11th April 2017 has been issued.
68.24	Syllabi of few courses proposed by the Department of Mathematics to be included in the basket of Pre-Ph.D. courses.	The Senate considered the syllabi of the following courses as proposed by the Department of Mathematics and recommended by the IAPC to be included in the basket of Pre-Ph.D. courses and decided to approve the same: 1. MAN-905: Advanced Statistical Inference 2. MAN-906: Theory of Integro-Differential Equations 3. MAN-907: Regularization Theory for Inverse Problems	Notification No. Acd/4627/UG-15 dated 11th April 2017 has been issued.

		4. MAN-908: Selected topics on Differential Subordination 5. MAN-909: Selected topics in Geometric Function Theory 6. MAN-910: Theory of Hardy Spaces 7. MAN-911: Selected topics in q- Hypergeometric Series 8. MAN-912: Selected Topics in Nature Inspired Optimization Techniques 9. MAN-913: Sobolev Spaces and Applications 10. MAN-914: Stochastic Partial Differential Equations	
68.25	Academic Calendar for the Academic Session 2017-18.	The Senate considered the proposal of Dean (Academics) to reintroduce mid-semester breaks in both the semesters without extending the semester on either side and decided to approve the same. It was also decided that to maintain the minimum working days, few Saturdays be converted to working days, if required. Accordingly, the Senate considered the Academic Calendar for the Academic Session 2017-18 as recommended by the Academic Calendar Committee and decided to approve the same.	Notification No. Acd/4628/UG-15 dated 11th April 2017 has been issued.
68.26	Award of the Ph.D. Degrees to the students who have completed the requirements for the award of the Ph.D. Degree in various disciplines w.e.f. October 2016 to till date.	The Senate considered the award of the Ph.D. Degrees to the students who have completed the requirements for the same in various disciplines w.e.f. October 3, 2016 till date and approved.	Notification No. Acd/4629/UG-15 dated 11th April 2017 has been issued.
68.29	Letter F.No. 24-1/2016-TS.1(sectt.) dated 28.11.2016 regarding Tuition fee for International students.	The Senate considered the letter from MHRD regarding tuition fee for International students and recommendation of the IAPC and decided to approve the following: "The foreign students selected for admission in the IITs through the JEE (Advanced)/GATE examination shall be	Notification No. Acd/4632/UG-15 dated 11th April 2017 has been issued.

		charged annual tuition fee of Rs.6 lakh per year. They may also be considered for any suitable fellowship." It was also decided that they may be considered for any scholarship at par with Indian students.	
68.30	Switchover from M.Tech. to Ph.D. programmes for students from NIT Uttarakhand under Teacher Trainee Scheme.	The Senate considered the recommendations of the IRC regarding provision of switching from M.Tech. to Ph.D. programmes for the students of NIT Uttarakhand under Teacher Trainee Scheme and decided to approve the following: Necessary provisions be made in the MoU so that the candidates under this scheme be given TWO years leave for doing the course work both for the M.Tech. and for the Ph.D, if required. In case, the desired modification is not feasible, the MoU be terminated. It was also decided that the candidates having CGPA ≥7.500 as below be given one time exception to switchover to Ph.D. programme: 1. Candidates, who have already completed M.Tech., be allowed to register as part-time Ph.D. candidate w.e.f. spring semester 2016-17 and the course work requirement be waived-off. 2. Candidates, who have completed one semester of M.Tech. dissertation, be allowed to register for Ph.D. as part-time candidate in autumn semester 2017 without any course work requirement after they finish their M.Tech.	Notification No. Acd/4633/UG-15 dated 11th April 2017 has been issued.

		3. Candidates, who are in M.Tech. 1st Year be allowed to switchover to Ph.D. without any course work requirement if the CGPA at the end of 1st Year is more than 8.50 else they will have to complete M.Tech. first and then only they can be admitted in Ph.D. programme.	
68.31	Number of seats in B.Tech./B.Arch./IDD and Integrated M.Sc. for the year 2017.	The Senate considered the letter from MHRD regarding revision of seats in view of minimizing the vacancies in CFTs and the number of vacant seats in various UG programmes in last three years and decided to modify the number of seats. The requests were made on the floor of the house to restart the following programmes of science departments and the Senate decided to approve the same with 20 seats in each: 1. Integrated M.Sc.(Physics) 2. Integrated M.Sc.(Chemistry) It was also decided that these programmes will start from 2017-18 session.	Notification No. Acd/4634/UG-15 dated 11th April 2017 has been issued.
68.32	Proposal of Joint Supervision of Doctor of Philosophy (Ph.D.)	The Senate reconsidered the proposal of Joint Supervision of Doctor of Philosophy (Ph.D.) in view of increasing need for collaborative work as practiced across the world and decided to approve the same. However, not more than two supervisors from the same department will be allowed to supervise the thesis jointly.	Notification No. Acd/4635/UG-15 dated 11th April 2017 has been issued.

68.36	Panel of Senate's Nominees on the Selection Committees for Group 'A' Academic positions.	The Senate considered the panel of Senate's Nominees on the Selection Committees for Group 'A' Academic positions and decided that the same be approved for the following Departments/Centres : 1. Alternate Hydro Energy Centre 2. Architecture. & Planning Department 3. Biotechnology Department 4. Chemical Engineering Department 5. Chemistry Department 6. Civil Engineering Department 7. Earthquake Engineering Department 8. Earth Sciences Department 9. Computer Science & Engineering Department 10. Electrical Engineering Department 11. Electronics & Communications Engineering Department 12. Hum. & Social Sciences Department 13. Hydrology Department 14. Management Studies 15. Mathematics Department 16. Mechanical & Industrial Engineering Department 17. Physics Department 18. Water Resources Development & Management Department 19. Saharanpur Campus (i) Applied Sciences & Engineering (ii) Polymer & Process Engineering (iii) Paper Technology 20. Metallurgical & Materials Engineering Department	Action has been completed.

68.37	Proposal of inducting students in Academic Bodies.	The Senate considered the proposal of inducting students in Academic Bodies and decided that students' representatives be invited in different academic bodies as below: 1. Senate (i) General Secretary, Students' Affairs Council (ii) General Secretary Academic Affairs (UG) (iii) General Secretary Academic Affairs (PG) (iv) Executive Committee of the Students' Senate will nominate a Ph.D. student. In case the General Secretary Academic Affairs (PG) is a Ph.D. student, the Executive Committee of the Students' Senate will nominate an M.Tech. Student. 2. DAPC (i) One final year students' representative from UG (ii) One students' representative from PG (iii) One students' representative from Ph.D. 3. CAPC (i) One final year students' representative from PG (ii) One students' representative from Ph.D. 4. DRC/CRC (i) One students' representative from Ph.D.	Notification No. Acd/4639/UG-15 dated 11th April 2017 has been issued.

		It was also decided that students' representatives from UG, PG and Ph.D. in DAPC/CAPC, DRC/CRC will be elected by the UG, PG and Ph.D. students, respectively of the concerned Departments/Centres. The tenure of these representatives will be for one academic session. These representatives are allowed as permanent invitees only and will be permitted during that part of agenda in which academic matters regarding UG, PG & Research are to be discussed. They will leave the meeting during discussion on confidential matters.	

Reported Item No. 68.27, 68.28, 68.33,68.34 and 68.35 were only for information of the Senate.

Item No. 69.3: **To consider the payment of Fellowship to M.Tech. students after submission of dissertation upto June 30th or till the period student stays in the campus for any work related to dissertation, whichever is earlier.**

The M.Tech. students are admitted for study for a period of two years which completes by the 30th June. According to MHRD, the Fellowship is also sanctioned for two years which completes by 30th June. Prior to Academic Calendar 2014-15, the last date of submission of dissertation was the 30th June but in the Academic Calendar 2014-15, the last date was changed to date of submission of dissertation, which was kept in May.

Now, the request from the M.Tech. students has been received stating that they may be paid **Fellowship upto 30th June or till the period the students stay & work in the campus, whichever is earlier.**

It is added that in the case of Ph.D. research scholars, MHRD assistantship is payable to them upto the date of their viva-voce or the end of that semester in which theses have been submitted (in the cases where research scholars stay at the campus for publishing their papers etc.), whichever is earlier. On the same footings, Institute may decide to pay the fellowship to M.Tech. students by the date of viva-voce or any other date up to 30th June (total duration of the course), if they actually stay and work on their research.

Submitted for consideration of the Senate.

Item No. 69.4: **To consider the proposal received from DOSW for inclusion of Cinematic Section in the list of proficiencies.**

The IAPC in its meeting held on 24.3.2017 considered the proposal received from DOSW for inclusion of Cinematic Section in the list of proficiencies and recommended that Cinematic Section be included as part of the Cultural Council and be also included in the list of proficiencies.

The above recommendation is submitted for consideration and approval of the Senate.

Item No. 69.5: To consider the renaming of some sections of the Hobbies Club received from Chief Advisor, Hobbies Club.

The IAPC in its meeting held on 31.5.2017 considered the above proposal and recommended the renaming as follows:

Current Name	Recommended Name
Star Gazing Section	Astronomy Section
Electronics Section	No change
Web Designing	Software Development Section

The above recommendation of the IAPC is submitted for consideration and approval of the Senate.

Item No. 69.6: To consider course evaluation issues of differently abled students.

The IAPC in its meeting held on 31.5.2017considered the course evaluation issues of differently abled students and recommended the following for consideration in the next Senate meeting:

(i) To approve facility of a scribe in the exams (MTE & ETE) to those students having physical limitation to write (e.g. visual disability), including limitation of speed (locomotor disorder etc.).

(ii) To approve compensatory time of 20 minutes per hour for students requiring services of scribes, and also to those having communication problem (e.g. due to Asperger's syndrome)

(iii) For sake of general awareness of the applicants, to include a paragraph, dedicated to such and other facilities available for PWD students at IITR, in the Admission Brochure and Information Brochure of all UG/PG/Ph.D. programs.

(iv) Assessment of each such student's special needs when admission is offered and then at the time of the Orientation Program after joining the Institute. Accordingly, to approve issuance of a certificate stating special academic needs of each such PwD student e.g. need for scribe &/ or extra time &/ or for large font-size question papers) at the time of her/his admission. The student would show this certificate to each of her/his teachers and would also submit a request (with the copy of this certificate) to the Head of the Department, at the start of each semester so that the needs are taken care of.

(v) To sensitize teaching and non-teaching staff about the needs and difficulties faced by differently abled students.

The instructor should be empowered to adopt suitable evaluation procedure.

The above recommendations of the IAPC are submitted for consideration and approval of the Senate.

Item No. 69.7: **To consider the percentage formula for the students who have CGPA between 4.00 and 5.00 because the converted formula is available from CGPA 5.00 and onward.**

The IAPC in its meeting held on 31.5.2017 recommended that the percentage formula being used for CGPA range 5.00 – 9.00 may be extended for the CGPA range 4.00 – 5.00 also. The modified conversion table is given below:

CGPA	Equivalent percentage of marks
4.00≤CGPA≤9.00	10*CGPA+5.00
CGPA>9.00	95.00

The above recommendation of IAPC is submitted for consideration and approval of the Senate.

Item No.: 69.8: To consider to delegate the power by Senate for approving the revised curricula and syllabi of courses of studies for various departments/Centres.

The IAPC in its meeting held on 31.5.2017 recommended that the power may be delegated to IAPC for approving the revised curricula and syllabi of courses of studies.

The above recommendation of IAPC is submitted for consideration and approval of the Senate.

Item No. 69.9: To consider the decision taken vide Senate Item No. 68.10 with respect to switch-over from M.Tech. to Ph.D. programme: To include centres running M.Tech. programme.

68.10: The Senate considered the recommendation of IAPC of extending switchover from M.Tech. to Ph.D. programme to every department having M.Tech. programme and decided to approve the same.

The IRC in its meeting held on 04.7.2017 while confirming the minutes of the 11th IRC meeting held on 02.02.2017, recommended that centers running M. Tech. programme may also be included in M. Tech. to Ph.D. switchover scheme.

The above request for adding centres running M.Tech. programme in M.Tech. to Ph.D. switchover scheme is submitted for consideration and approval of the Senate.

Item No.69.10: To consider the Research Areas recommended by Four Departments.

The IRC in its meeting held on 04.07.2017considered the departmental recommendations and recommended the same for approval of the Senate. This can be added to the list of already approved Research areas of the Departments.

Sl. No.	Department	Research Areas
1.	Earth Sciences	EARTH SCIENCES
2.	Disaster Mitigation and Management	DISASTER MITIGATION & MANAGEMENT
3.	CTRANS	TRANSPORTATION SYSTEMS
4.	Metallurgical & Materials Engg.	METALLURGICAL & MATERIALS ENGINEERING

The above is submitted for consideration and approval of the Senate.

Item No. 69.11: To consider for allowing B.Tech. + M.Tech. in Computer Science programme for eligibility of Ph.D. admission in the Department of Electronics & Communication Engineering.

The IRC in its meeting held on 04.07.2017 considered for allowing B.Tech. + M.Tech. in Computer Science programme for eligibility of Ph.D. admission in the Department of Electronics & Communication Engineering and recommended the same for the consideration of the Senate.

The above recommendation is submitted for consideration and approval of the Senate.

Item No. 69.12: To consider the proposal of increasing the duration for candidacy in Ph.D. programme.

The IRC in its meeting held on 04.7.2017 discussed the issue of duration of candidacy in depth and resolved that the duration should be changed as follows:

a. For Ph.D. students with M.Tech./M.Arch./ MURP/MCA/M. Tech. (Integrated/IDD) or equivalence degree and M.Sc./MA/MBA or equivalent admitted to Science/HSS/Management department: 18 months.

b. For Ph.D. students with B.Tech. or equivalent or M.Sc. degree or equivalent admitted to Engineering discipline: 24 months.

With a rider that last six months shall be devoted to non-course related activities of Ph.D. programme such as comprehensive exam (Written/oral) and research proposal for candidacy.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.13: To consider the admission of Project Fellows, working in a consultancy project having R&D component as a Ph.D. research scholar.

Senate resolution 64.3 says "fellow selected in consultancy project shall not be considered for Ph.D. programme directly."

The IRC in its meeting held on 04.7.2017 discussed the issue in the light of previous decision of the Senate (64.3 above) and the requirement posed by certain Government and non-Government agencies who are not allowed to give sponsored research projects but their work contracts have research component embedded in it.

The IRC recommended that project fellow under SRIC approved Consultancy Projects with R&D component shall be allowed to register for Ph.D. by following the procedure adopted for IITR Assistantship scheme subject to the condition that the minimum duration of the project at the time of admission is more than one and a half year.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.14: To consider re-constitution of the Evaluation Committee for CSIR and UGC fellows who enroll themselves as Ph.D. candidate for upgradation from JRF to SRF.

The IRC in its meeting held on 04.07.2017 recommended that the committee to evaluate the performance of the candidate working as CSIR/UGC fellow admitted to Ph.D. programme shall consist of SRC committee along with an external expert from CSIR lab (for CSIR fellows) / outside the institute (for UGC fellows).

The above recommendation is submitted for consideration of the Senate.

Item No. 69.15: To consider provision of rolling advertisement for admitting Ph.D. candidates under national funding schemes other than IITR Assistantship and procedure thereafter.

The IRC in its meeting held on 04.07.2017 considered the request of rolling advertisement from Science Departments. The IRC took note of the Science Departments and resolved that Academic Office will come out with a rolling advertisement for Ph.D. admissions through research funding schemes other than that with IITR Assistantship. The applications shall be received in the departments and the departments will conduct the interviews on an appropriate date. The list of selected candidates, who will be offered admission in the next academic session, will be sent by the department to the Academic office for further processing. However, such candidates will start working as JRF in the project from the date of selection in the admitting department.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.16: **To consider following new criteria for Ph.D. admission in the CSE as proposed by the Department of Computer Science & Engineering:-**

(i) M.Tech./ME in Computer Science and Engineering / Information Technology/ Software Engineering or equivalent.

(ii) M.Tech./ME in Electrical Engineering/Electronics and Communications Engineering or equivalent.

(iii) B.Tech./BE in Computer Science and Engineering/Information Technology or equivalent.

Either one of the above (i), (ii) and (iii) and qualified national level graduate entrance test: GATE/UGC-NET/CSIR-NET in Computer Science/Information Technology.

The IRC in its meeting held on 04.07.2017 recommended to send the request of the department to the Senate for consideration.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.17: To consider conduct of viva-voce of Ph.D. candidate through Skype under conditions that examiner is not in a position to travel to IITR.

The IRC in its meeting held on 04.07.2017discussed the issue of conducting the viva-voce examination of a Ph.D. candidate through Skype and decided that the request for conduct of viva-voce examination through Skype should be considered by Academic Office on case-to-case basis and shall not be the replacement of the existing procedure of the conduct of viva-voce examination.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.18: To consider the admission of candidate for Ph.D. working as Woman scientist under national funding scheme.

The IRC in its meeting held on 04.07.2017 considered the above issue and recommended that the procedure for the selection of candidate shall be at par with those admitted with IITR Assistantship.

The above recommendation is submitted for consideration of the Senate.

Item No. 69.19: To consider the certificate mentioning research area with regard to Ph.D. Degree.

The format **(Appendix 'A')** as approved by the Senate in its meeting held on 11th August 2016 could not be used in the Convocation of 2016. The format used in this Convocation **(Appendix 'B')** for the award of degree may be used in future alongwith a separate certificate mentioning research area of the candidate as given at **(Appendix 'C').**

The issue is placed before the Senate for consideration and approval please.

Serial No. 17xxxx

Enrolment No. xxxxxxxx

भारतीय प्रौद्योगिकी संस्थान रुड़की

अभिषद् की अनुशंसा पर

पॉलिमर एण्ड हाइड्रोकार्बन में विद्या वाचस्पति

की उपाधि

Broad Academic Entity

थालिगारि संदीप कुमार

को, जिन्होंने इस उपाधि की अवाप्ति हेतु विनियम विहित अपेक्षाओं को दिनांक नवम्बर 11, 2016 में सफलतापूर्वक पूरा कर लिया है, एतद्द्वारा प्रदान करता है।

भारतीय गणराज्य के अन्तर्गत रुड़की में आज, दिनांक सितम्बर 30, 2017, संस्थान की मुद्रा अंकित यह उपाधि दी गई।

- 33 -

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

On the recommendation of the Senate hereby confers the degree of

Doctor of Philosophy in Polymer and Hydrocarbons

upon

Broad Academic Entity

THALIGARI SANDEEP KUMAR

who has successfully completed on November 11, 2016 the requirements prescribed under the regulations for the award of this degree

given this day, September 30, 2017, under the seal of the Institute at Roorkee in the Republic of India.

अध्यक्ष, अभिशासक परिषद्
Chairman, Board of Governors

निदेशक एवं अध्यक्ष, अभिषद्
Director & Chairman, Senate

कुलसचिव
Registrar

Appendix 'A'
Item No. Senate/69.19

Serial No. 162014

Enrolment No. 09910002

भारतीय प्रौद्योगिकी संस्थान रुड़की

अभिषद् की अनुशंसा पर

विद्या वाचस्पति

की उपाधि

आँचल शर्मा

को, जिन्होंने इस उपाधि की अवाप्ति हेतु विनियम विहित अपेक्षाओं को दिनांक मार्च 22, 2016 में सफलतापूर्वक पूरा कर लिया है, एतद्द्वारा प्रदान करता है।

शोध प्रबन्ध शीर्षक: एनर्जी एफीशियन्ट रेट्रोफिट मॉडल फॉर इंजीनियरिंग केम्पसिस इन इंडियन कम्पोजिट क्लाईमेट

भारतीय गणराज्य के अन्तर्गत रुड़की में आज, दिनांक सितम्बर 30, 2016, संस्थान की मुद्रा अंकित यह उपाधि दी गई।

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

on the recommendation of the Senate hereby confers the degree of

Doctor of Philosophy

upon

AANCHAL SHARMA

who has successfully completed on March 22, 2016 the requirements prescribed under the regulations for the award of this degree.

Thesis Title: ENERGY EFFICIENT RETROFIT MODEL FOR ENGINEERING CAMPUSES IN INDIAN COMPOSITE CLIMATE

Given this day, September 30, 2016, under the seal of the Institute at Roorkee in the Republic of India.

अध्यक्ष, अभिशासक परिषद्
Chairman, Board of Governors

निदेशक एवं अध्यक्ष, अभिषद्
Director & Chairman, Senate

कुलसचिव
Registrar

- 34 -

Appendix 'B'
Item No. Senate/69.19

Appendix 'C'
Item No. Senate/69.19

Type-I

भारतीय प्रौद्योगिकी संस्थान रुड़की

रुड़की

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

Serial No. .....

DOCTOR OF PHILOSOPHY COMPLETION CERTIFICATE

Enrolment No.	:	**10918001**
Name of Student	:	**Mr. Arif Iqbal**
Department/Centre	:	**Electrical Engineering**
Research Area	:	**Multi-phase Order Drives**
Title of Thesis	:	**ANALYSIS OF SIX-PHASE SYNCHRONOUS MOTOR**
Name of Supervisor (s)	:	**Dr. G.K. Singh** **Dr. Vinay Pant**
Date of Viva Voce	:	**December 15, 2015**
Date of Provisional Degree Certificate	:	**December 17, 2015**

निदेशक एवं अध्यक्ष, अभिषद्
Director & Chairman, Senate

कुलसचिव
Registrar

Date: September 30, 2016

Type-II

भारतीय प्रौद्योगिकी संस्थान रुड़की

रुड़की

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

Serial No. .....

DOCTOR OF PHILOSOPHY COMPLETION CERTIFICATE

Enrolment No.	:	**10918001**
Name of Student	:	**Mr. Arif Iqbal**
Department/Centre	:	**Electrical Engineering**
Title of Thesis	:	**ANALYSIS OF SIX-PHASE SYNCHRONOUS MOTOR**
Name of Supervisor (s)	:	**Dr. G.K. Singh** **Dr. Vinay Pant**
Date of Viva Voce	:	**December 15, 2015**
Date of Provisional Degree Certificate	:	**December 17, 2015**

निदेशक एवं अध्यक्ष, अभिषद्
Director & Chairman, Senate

कुलसचिव
Registrar

Date: September 30, 2016

भारतीय प्रौद्योगिकी संस्थान रूड़की
रूड़की – २४७ ६६७ (भारत)

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

सीनेट की उनहत्तरवीं बैठक हेतु अनुपूरक कार्य सूची

SUPPLEMENTARY AGENDA FOR THE 69th MEETING OF THE SENATE

बैठक सं0	:	उनहत्तरवीं
MEETING No.	:	**69th**
स्थान	:	सीनेट हॉल, भा0प्रौ0सं0रूड़की
VENUE	:	**Senate Hall, IIT Roorkee**
दिनांक	:	28 जुलाई 2017
DATE	:	**28th July 2017**
समय	:	3.30 बजे अपरान्ह
TIME	:	**3.30 P.M.**

भारतीय प्रौद्योगिकी संस्थान रूड़की
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
रूड़की 247 667
ROORKEE – 247 667

SUPPLEMENTARY AGENDA/अनुपूरक कार्यसूची

Item No. / मुद्दा सं0	Particulars/विवरण	Page(s)/ पृष्ठ
69.20	प्रोविजनल प्रमाण पत्र में परिवर्तन को नई संरचना के अनुसार अंडर ग्रेजुएट्स को जारी करने और 2017 बैच के लिए स्वीकृत प्रमाणपत्रों पर विचार करना। To consider the changes in the provisional certificate to be issued to Undergraduates in line with the New Structure and to report the approved certificates for batch 2017.	37-39
69.21	जैम 2018 के लिए संशोधित न्यूनतम शैक्षणिक योग्यता (एमईक्यू) पर विचार करना। To consider the revised Minimum Educational Qualification (MEQs) for JAM 2018	40-58
69.22	तृतीय वर्ष (चतुर्थ वर्ष) के छात्रों को प्रथम वर्ष (द्वितीय वर्ष) के एक कोर्स के लिए बैक पेपर के रूप में पंजीकरण करने की अनुमति के प्रस्ताव पर विचार करना। To consider the proposal of permitting III year (IV year) students to register for one course of I year (II year) as back paper.	59
69.23	दीक्षांत समारोह 2017 में एवं उसके बाद के दीक्षांत समारोहों में विभिन्न गणमान्य व्यक्तियों/संकाय सदस्यों/ उत्तीर्ण छात्रों के लिए ड्रेस कोड पर विचार करना। To consider Dress Code for various dignitaries/faculty members/graduating students at Convocation 2017 and onwards.	60

69.24	विभिन्न उत्तीर्ण छात्रों को डिग्री प्रदान करने के लिए संस्थान के वार्षिक दीक्षांत समारोह को एक दिन के बजाए दो दिनों के लिए आयोजित करने पर विचार करना। To consider holding of Annual Convocation of the Institute for the award of degrees to various graduating students on two days instead of one day as presently done.	61
69.25	उन छात्रों को पी0 एच0डी0 उपाधि प्रदान करने पर विचार किया जाना, जिन्होंने विभिन्न पाठ्यक्रमों में 03 मार्च 2017 से अब तक उपाधि प्राप्त किए जाने की अर्हता प्राप्त की है। To consider award of the Ph.D. Degrees to the students who have completed the requirements for the award of the Ph.D. Degree in various disciplines w.e.f. 3rd March 2017 to till date.	62-70
69.26	छात्रों को छात्रवृत्ति और पुरस्कार प्रदान करने के लिए सीनेट की स्थायी समिति के प्रस्ताव पर विचार करना। To consider the proposal for Senate Standing Committee for Scholarships and Prizes for students.	71-72
69.27	भौतिकी विभाग द्वारा प्रस्तावित एम.टेक (फोटोनिक्स) के पाठ्यक्रमों की अध्ययन विषयवस्तु को रिपोर्ट करना। To report the syllabi of M.Tech. (Photonics) proposed by the Physics Department.	73-87
69.28	विकलांगो के अधिकार अधिनियम 2016 में वर्णित अधिकारों की धारा (32)(1) के कार्यान्वयन के संबंध में पत्र एफ सं0 32–9/2017–टीएस–आई दिनांक 24.04.2017 और एफ सं0 32–9/2017–टीएस–आई दिनांक 04.05.2017 और जेईई/जेएएम–2017 के लिए सीट मैट्रिक्स को रिपोर्ट करना। To report the Seat Matrix for JEE/JAM -2017 and inform the provisions to be made regarding implementation of Section (32)(1) of the Rights of Persons with Disabilities Act, 2016 from next academic year.	88-91
69.29	भौतिकी विभाग द्वारा प्रस्तावित बी. टेक (इंजीनियरिंग भौतिकी) और एम.एस. सी (भौतिकी) पाठ्यक्रमों की संरचनाओं में मामूली संशोधनों को रिपोर्ट करना । To report the minor modifications in B.Tech. (Engineering Physics) and M.Sc. (Physics) course structures as proposed by the Department of Physics.	92-113
69.30	गणित विभाग द्वारा प्रस्तावित एमएनए–657: एडवांस्ड आपरेशन रिसर्च के पाठयक्रम की अध्यन विषयवस्तु को रिपोर्ट करना। To report the syllabus of MAN-657: Advanced Operations Research, as proposed by the Department of Mathematics.	114-115

69.31	इंटिग्रेटिड एम.एस.सी (भौतिकी), इंटिग्रेटिड एम.एस.सी (रसायन विज्ञान) के पाठयक्रमों की संरचनाओं एवं सीवाईएन–101 के पाठयक्रम को रिपोर्ट करना। To report the course structure of Integrated M.Sc. (Physics) and Integrated M.Sc. (Chemistry) and syllabus of course CYN-101- Introduction of Chemical Science.	116-138
69.32	शोध छात्रों को थीसिस डिफेंस तक फेलोशिप देने के अनुमोदन को रिपोर्ट करना। To report the extension of IITR Assistantship to research scholars till defence.	139-140
69.33	श्री अजय जैन, (अनुक्रमांक सं0 10114002), बी. टैक (सीएसई) की समय सीमा में वृद्वि की प्रार्थना में अनुमोदन को रिपोर्ट करना। To report the extension granted to Mr. Ajay Jain, (Enrolment No. 10114002), B. Tech. (CSE).	141
69.34	श्री सुपनदीप सिहं , बी. टैक (पीएंडपी) को पीईएन–352 कोर्स के पुर्नपरीक्षा की प्रार्थना के अनुमोदन को रिपोर्ट करना। To report the extension granted to Mr. Supandeep Singh, B. Tech. (P&P) for re-examination in the course PEN-352.	142
69.35	श्री नरेन्द्र कुमार, एमटेक द्वितीय वर्ष,(भूगर्भीय प्रौद्योगिकी) और सुश्री सलोनी अग्रवाल, इंटिग्रेटिड एमटेक प्रथम वर्ष,(भूगर्भीय प्रौद्योगिकी) को परीक्षा में अवांछनीय कार्य के कारण लगी पाबंदी पर छूट देने को रिपोर्ट करना। To report the action on mercy appeals by Mr. Narender Kumar, M.Tech. II year (Geological Technology) and Ms. Saloni Agarwal, Integrated M.Tech. I year (Geological Technology).	143
69.36	मानविकी एवं सामाजिक विज्ञान विभाग और आपदा निवारण प्रबंधन उत्कृष्टता केन्द्र के विभिन्न कोर्सों की अध्ययन विषयवस्तु पर अनुमोदन को रिपोर्ट करना। To report the syllabi of courses related to Department of Humanities & Social Sciences and Centre of Excellence in Disaster Mitigation and Management.	144-160
69.37	सुश्री निधि, रिसर्च स्कोलर,(अनुक्रमाकं सं0 16925005) प्रथम वर्ष की प्रार्थना पर केडिट कोर्स को आडिट कोर्स में बदलने और उसको पास घोषित करने की अनुमति को रिपोर्ट करना। To report the action on the request of Ms. Nidhi (Enrolment No. 16925005), Research Scholar, I year, to convert her Credit Course into Audit Course for continuing in Ph.D. programme.	161

Item No. 69.20 **To consider the changes in the provisional certificate to be issued to Undergraduates in line with the New Structure and to report the approved certificates for batch 2017.**

The new undergraduate programme structure allows a student to take up courses leading to a minor specialization or to take honours courses. This has necessitated a change in the provisional certificate which is issued to the students after completion of programme requirements and before award of degree.

On the recommendation of Dean Academic Affairs the certificates to be issued to graduating students of batch 2017 were approved by the Chairman, Senate **(Appendix 'A').**

These formats are presented for the consideration and approval of the Senate for subsequent batches.

Appendix 'A'
Item No. Senate/69.20

Serial No. _____

PROVISIONAL CERTIFICATE

This is to certify that

YASH AGRAWAL

Enrollment No. 13117078 has passed the final Examination

of

BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING)

from this Institute during the session 2016-17 obtaining

C.G.P.A 7.672 on a ten point scale
in First Division

He/She has also completed the requirement for Departmental Honours Courses

Dated: **ASSISTANT REGISTRAR (AS)**

Note: The above student has qualified for above award as degree which will be issued in due course. This is only a Provisional Certificate and should not be taken as degree.

Serial No. _____

PROVISIONAL CERTIFICATE

This is to certify that

ASHUTOSH RUNGTA

Enrollment No. 13112019 has passed the final Examination

of

BACHELOR OF TECHNOLOGY (CHEMICAL ENGINEERING)

from this Institute during the session 2016-17 obtaining

C.G.P.A 8.230 on a ten point scale
in First Division

He/She has also completed the requirement for Minor Specialisation in Computer Science and Engineering

Dated: **ASSISTANT REGISTRAR (AS)**

Note: The above student has qualified for above award as degree which will be issued in due course. This is only a Provisional Certificate and should not be taken as degree.

Item No. 69.21: To consider the revised Minimum Educational Qualification (MEQs) for JAM 2018

Director, IIT Bombay and Chairman JAM-AB 2018 has sent a letter dated 4th July 2017 requesting the institute to consider the following:

(i) Minimum Educational Qualification (MEQs) should be common for similar programmes offered across all admitting institutes. There should be no restriction based on courses taken at 10+2 level.

(ii) Minimum Educational Qualification (MEQs) for engineering students should be removed and these students be admitted based on their JAM rank only.

The views of the departments are placed as **Appendices 'A', 'B', 'C', 'D', 'E' & 'F'.**

Revised MEQs are presented in **Appendix 'G'** for consideration and approval of the Senate.

DEPARTEMNENT OF CHEMISTRY

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE

No.ES/S /17 **Date July 21, 2017**

Chairman GATE JAM 2018

Ref. Letter no. IITR/JAM/MEQ/2017-2018/25 DATED July 7, 2017

This has reference to above mentioned letter GATE / JAM-2018. In this regard, department has already informed the decision on point (i). Regarding point (ii) it is inform you that the proposed format & qualifications are appropriate and we recommend no modification.

This is for further necessary at your end.

(M.R. Maurya)
Prof. and Head

रसायन विभाग
भारतीय प्रौद्योगिकी संस्थान रूड़की

DEPARTMENT OF CHEMISTRY
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

No.CY/N-16/ 405 /2017 Dated: July 21, 2017

Prof. P.M. Pathak
Chairman, GATE-JAM 2018

In reference to your office letter No.IITR/JAM/MEQ/2017-18 dated 7th July, 2017 about Minimum Educational Qualification (MEQs) for JAM 2018 and MEQ for engineering students appearing in JAM 2018. In this connection, it is intimated that this issue was discussed in the DFC and the recommendation of the DFC is enclosed.

(M.R. MAURYA)
PROFESSOR & HEAD
21/7/17

Encl: As above

DEPARTMENT OF CHEMISTRY
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

No.CY/N-1/1048 /2017 Dated: July 21, 2017

MINUTES OF THE MEETING OF THE DEPARTMENTAL FACULTY COMMITTEE

A meeting of the DFC was held on July 19, 2017 at 4:00 p.m. in the Committee Room of the Department. The following members were present:

1. Dr. M. R. Maurya	Professor & Head
2. Dr. Ravi Bhushan	Member
3. Dr. Anil Kumar	Member
4. Dr. Mala Nath	Member
5. Dr. Bina Gupta	Member
6. Dr. R.K. Peddinti	Member
7. Dr. K.R. Justin Thomas	Member
8. Dr. R. K. Dutta	Member
9. Dr. P. Jeevanandam	Member
10. Dr. Naseem Ahmed	Member
11. Dr. Anuj Sharma	Member
12. Dr. M. Sankar	Member
13. Dr. Paritosh Mohanty	Member
14. Dr. Pallavi Debnath	Member
15. Dr. Tapas Kr. Mandal	Member
16. Dr. H.C. Kandpal	Member
17. Dr. C.N. Ramachandran	Member
18. Dr. Prasenjit Kar	Member
19. Dr. K.K. Sadhu	Member
20. Dr. Debasis Banerjee	Member

Item No.1: The minutes of the last meeting held on 05.06.2017 were confirmed.

Item No. 2: To consider the letter No.Acd/5347/IAPC-55-56 dated July 03, 2017 received from the office of Dy.Registrar (Academics) regarding recommendation of the subcommittee for admission of exceptional candidates to B. Tech in IITs.

DFC discussed and deliberated on the recommendations of the subcommittee on the above issue and resolved that JEE has much wider international recognition and admission through JEE is better than any other test like SAT. Opening to admission by any other channel may severely harm the spirit of the JEE.

Item No. 3: To consider the letter from GATE/ JAM letter No.IITR /JAM /MEQ/ 2017-18 dated 7th July 2017 received from the office of Chairman, GATE-JAM 2018.

DFC discussed and agreed to drop compulsory mathematics at 10 + 2 level form the Minimum Educational Qualification (MEQ) for students appearing in JAM 2018 for Chemistry.

However, DFC did not feel competent to make any comments on the MEQ for engineering students appearing in JAM 2018 as the department did not deal in the past with such cases.

Contd...2

Item No. 4: To consider the letter No.DFP(Plng)/Grant/2017-18/446/04 dated 5.7.17 received from the office of Dean, Finance & Planning.

DFC deferred this issue for the next meeting. OCs of different laboratories (B. Tech., M. Tech., M.Sc. and Integrated M. Sc.) were requested to prepare the list of requirements as per the course curriculum.

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

Maurya

(M.R. MAURYA)
PROFESSOR & HEAD
21/7/17

Copy to: 1. Asstt. Registrar to Director for Director's kind information please.
2. Supdt. to Dy. Director for Dy. Director's kind formation please.
3. Dean of Faculty Affairs.
4. Dean, Academic Affairs.
5. All Faculty Members of Chemistry Department.

DEPARTMENT OF BIOTECHNOLOGY
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

No. BT/DFC/2017/ 6767

Dated: July 12, 2017
14

Professor P. M. Pathak
Chariman
GATE-JAM - 2018
IIT Roorkee

Subject: Your letter no. IITR/JAM/MEQ/2017-18 dated July 7, 2017 regarding Minimum Educational Qualifications (MEQs) for JAM 2018 and MEQ for engineering students appearing in JAM 2018.

Dear Sir,

The above mentioned issue was discussed in the DFC meeting held on July 7, 2017.

The DFC accepts the proposed MEQ for JAM 2018 for M.Sc. Biotechnology as "Any Branch/ Subject" as proposed by JAM Advisory Board (JAM-AB).

With kind regards.

Prof. & Head
12/8/17
प्रा० एवं विभागाध्यक्ष / Professor & Head
जैव प्रौद्योगिकी विभाग / Deptt. of Biotechnology
भारतीय प्रौद्योगिकी संस्थान / Indian Institute of Technology
रुड़की / Roorkee-247 667 (U.K.)

Seen
Chairman GATE
14/7

Appendix 'C'
Item No. Senate/69.21

भू-विज्ञान विभाग
DEPARTMENT OF EARTH SCIENCES
भारतीय प्रौद्योगिकी संस्थान रुड़की,रुड़की
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE

No.ES/S-43/2238 /17 **Dated: July 20 ,2017**

Chairman GATE-JAM 2018

Ref: Letter no. IITR /JAM /MEQ /2017-2018/25 dated July 7, 2017.

This has reference to above mentioned letter GATE / JAM-2018. In this regard, it is inform that since no information/views from the faculty members of this dept. have been received till date, hence the information from this dept. may be treated as 'NIL'.

(D.C.Srivastava)
Prof. and Head

भू-विज्ञान विभाग
DEPARTMENT OF EARTH SCIENCES
भारतीय प्रौद्योगिकी संस्थान रुड़की,रुड़की
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, ROORKEE

No.ES/S-MW/2741 /17 Dated: July 21 ,2017

Chairman GATE-JAM 2018

Ref: Letter no. IITR /JAM /MEQ /2017-2018/25 dated July 7, 2017.

This has reference to above mentioned letter GATE / JAM-2018. In this regard, it is informed that the proposed format & qualifications are appropriate and we recommend no modification.

This is for further necessary at your end.

D.C. Srivastava
(D.C.Srivastava)
Prof. and Head

गणित विभाग
DEPARTMENT OF MATHEMATICS
भारतीय प्रौद्योगिकी संस्थान रूडकी
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Dy. No. 42
Dt. 20-7-2017

No.Maths/347/M.Sc. File

Dated: July 20, 2017

Chairman, GATE-JAM 2018

Please refer to your letter No. IITR/JAM/MEQ/2017-18 dated 7th July,2017 regarding Minimum Educational Qualification (MEQs) for JAM 2018 and MEQ for engineering students appearing in JAM2018.

The above matter was discussed in the meeting of DAPC held on 19.7.2017 (copy enclosed) and resolved the following:

1. Recommendations of the JAM-18 Advisory Board may be accepted.

2. In particular for admission in M.Sc. Mathematics programme at IIT Roorkee the MEQ for JAM-18 is recommended as follows:

   a. There is no restriction on subjects studied in 10 +2 level.
   b. Minimum Two years/ Four Semesters of Mathematics in Bachelor's Degree.

20/7/17
(RAMA BHARGAVA)
Prof. & Actg. Head

Encl: As above

DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

No.MATH/346 /DAPC Dated: 20.07.2017

MINUTES OF THE DAPC

A meeting of the DAPC was held on 19.07.2017, Wednesday at 04:00 PM in the Committee Room of the Department.

The followings members were present:-

1.	**Prof. N.Sukavanam**	**Chairman**
2.	Dr. Shiv Kumar Gupta	Member
3.	Dr. Uaday Singh	-do-
4.	Dr. R.K.Pandey	-do-

Following actions were taken:-

1. The minutes of the DAPC meeting held on 30.03.2017 were confirmed.
2. Considered the letter No. IITR/Jam/MEQ/2017-18 dated 07.07.17 by chairman, GATE-JAM 2018, regarding Minimum Educational Qualification (MEQ) for JAM-2018.DAPC resolved that the recommendations of the JAM-18 advisory board may be accepted. In particular for admission in M.Sc Mathematics program at IIT Roorkee the MEQ for JAM-18 is recommended as :-

   a. There is no restriction on subjects studied in 10+2 level.
   b. Minimum Two Years /Four Semesters of Mathematics in Bachelor 's Degree.

3. The Meeting ended with a vote of thanks to the Chair.

N. Suka 20/7/17.

N.Sukavanam
Chairman, DAPC

Copy to:-
1. Head Mathematics.
2. Dean Academics.
3. All members of DAPC.
4. Chairman GATE- JAM
5. DAPC File.

Appendix 'E'
Item No. Senate/69.21

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
IIT ROORKEE

No./ 2489 /HSS/HOD/2017-18 Date: July 14, 2017

GATE & JAM OFFICE
Dy. No. 39
Dt. 17-7-2017
INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

Chairman, GATE-JAM 2018
IIT Roorkee

Dear Sir,

In reference to the letter no. IITR/JAM/MEQ/2017-18 dated: July 7, 2017, please find below the recommendations from the Department for admission of students in M.Sc. Economics programme through JAM 2018.

1) With reference to Point 1: Since two-years M.Sc. Economics is a unique programme offered only by IIT Roorkee and is not common across all IITs, therefore, Point 1 is not applicable for this programme. However, the Department agrees that there should not be any restrictions based on courses taken at 10+2 level. Therefore, we have redefined the admission eligibility criteria for M.Sc. Economics programme as under:

Admission Eligibility:
Minimum qualification for admission to M.Sc. (Economics) programme include one of the following degrees or their equivalents: B.Tech./B.E./B.Sc.(PCM)/B.Stat and B.A./B.Com (with mathematics as one of the subjects) with at least First Division.

2) With reference to Point 2: The Department agrees with the recommendation that Minimum Educational Qualification (MEQ) for Indian engineering students should be removed and these students should be admitted on the basis of their JAM rank only.

3) The department proposes that selection of students in the M.Sc. Economics programme [code: 1806] should be ONLY on the basis of Mathematics (MA) test paper. Therefore, admission through Mathematical Statistics (MS) should be discontinued from JAM 2018 onwards. In this respect, the allocation of seats for Economics [1806] be revised as follows (on page 17 of JAM admission brochure):

M.Sc. (4 semesters)	Economics
[Programme code] Seats Available	[1806] MA 15+8+5+2 ST (1)
Test Paper (Test Paper Code)	Mathematics (MA)

(S.P Singh) 14/7/17
Professor and Head

File
17/7/17

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
IIT ROORKEE

(7)

No./ 2489 /HSS/HOD/2017-18 Date: July 14, 2017

Chairman, GATE-JAM 2018
IIT Roorkee

Dear Sir,

In reference to the letter no. IITR/JAM/MEQ/2017-18 dated: July 7, 2017, please find below the recommendations from the Department for admission of students in M.Sc. Economics programme through JAM 2018.

1) With reference to Point 1: Since two-years M.Sc. Economics is a unique programme offered only by IIT Roorkee and is not common across all IITs, therefore, Point 1 is not applicable for this programme. However, the Department agrees that there should not be any restrictions based on courses taken at 10+2 level. Therefore, we have redefined the admission eligibility criteria for M.Sc. Economics programme as under:

Admission Eligibility:
Minimum qualification for admission to M.Sc. (Economics) programme include one of the following degrees or their equivalents: B.Tech./B.E./B.Sc.(PCM)/B.Stat and B.A./B.Com (with mathematics as one of the subjects) in the whole programme ~~with at least 55% marks~~.

2) With reference to Point 2: The Department agrees with the recommendation that Minimum Educational Qualification (MEQ) for Indian engineering students should be removed and these students should be admitted on the basis of their JAM rank only.

3) The department proposes that selection of students in the M.Sc. Economics programme [code: 1806] should be ONLY on the basis of Mathematics (MA) test paper. Therefore, admission through Mathematical Statistics (MS) should be discontinued from JAM 2018 onwards. In this respect, the allocation of seats for Economics [1806] be revised as follows (on page 17 of JAM admission brochure):

M.Sc. (4 semesters)	**Economics**
[Programme code] Seats Available	[1806] MA 15+8+5+2 ST (1)
Test Paper (Test Paper Code)	Mathematics (MA)

SP Singh
(S.P Singh)
Professor and Head

CC- Dean Academic Affairs

भौतिकी विभाग
DEPARTMENT OF PHYSICS
भारतीय प्रौद्योगिकी संस्थान रूड़की
INDIAN INSTITUTE OF TECHNOLOGY-ROORKEE

No.Phy/DAPC/ 385 Dated:12.7.2017
13

Chairman, GATE-JAM-2018
IIT-Roorkee

With reference to your letter No. IIIR/JAM/MEQ/2017-18 dated 7.7.2017, it is to inform you that the Departmental Academic Programme Committee (DAPC) in its meeting held on 11.7.2017 has resolved the following:

" No change is required in the present minimum educational qualification for admission in M.Sc. (Physics) through JAM."

Copy of the DAPC minutes is enclosed.

Encl: As above

(K.L. Yadav)
Professor & Head

Seen
Chairman GATE 13/7/17
13/7/17

Minutes of the meeting of the Departmental Academic Programme Committee (DAPC) held on 11.7.2017 at 12. noon in the Committee Room.

The following members attended the meeting:

1. Prof. G.D. Varma - Chairman
2. Dr. Vipul Rastogi
3. Dr. Anirban Mitra
4. Dr. M.V. Sunil Krishna
5. Dr. P.C. Srivastava
6. Dr. Ajay Y. Deo
7. Dr. Moumita Maiti
8. Mr. Vikas Yadav - Students' Representative

The DAPC members discussed the following items:

i) Admission of exceptional candidates to B. Tech.(UG) program.
ii) Minimum qualification for admission in M.Sc. Ist year through JAM

The Committee resolved the following:

i) There is no necessity to open any other channels for admission to U.G.(B.tech.) programmes of IITs.
ii) No change is required in the present minimum educational qualifications for admission in M.Sc. (Physics) through JAM.

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

(G.D. Varma) 11.07.17
Chairman, DAPC

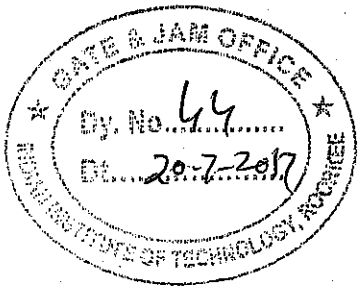
DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY-ROORKEE

No. Phy/DAPC/ 383 Dated: 11.7.2017

Copy to :

1. Professor & Head, Physics Department for information
2. All DAPC members
3. DAPC file

Revised Minutes of the meeting of the Departmental Academic Programme Committee (DAPC) held on 20.7.2017 at 12. noon in the Committee Room.



The following members were present in the meeting:

1. Prof. G.D. Varma - Chairman
2. Dr. Vipul Rastogi
3. Dr. Anirban Mitra
4. Dr. M.V. Sunil Krishna
5. Dr. P.C. Srivastava
6. Dr. Moumita Maiti

The Committee discussed the minimum educational qualifications (MEQs) for engineering students to be admitted to M.Sc. Physics Ist year on the JAM Rank.

The Committee resolved that B. Tech. students be admitted to M.Sc. Physics Ist year on the basis of their JAM rank.

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

(G.D. Varma)
Chairman, DAPC

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY-ROORKEE

No. Phy/DAPC/ 410 Dated: 20.7.2017

Copy to :

1. Professor & Head, Physics Department for information
2. All DAPC members
3. DAPC file
4. Chairman, GATE-2018

JAM 2018

Revised Minimum Educational Qualification (MEQ)

Test Paper (Test Paper Code)	Academic Programme(s)	Institute(s)	Minimum Educational Qualification(s) for Admission			Departments feedback on revised MEQ JAM 2018
			Current		Proposed Revised	
			Essential subjects in Bachelor's Degree among with minimum duration	Essential subjects at (10+2) level	Essential subjects in Bachelor's Degree among with minimum duration	
Biotechnology (BT)	M.Sc. Biotechnology	IITR	Any Branch/Subject	Mathematics	Any Branch/Subject	The DFC accepts the proposed MEQ for JAM 2018 for M.Sc. Biotechnology as "Any Branch/subject" as proposed by JAM Advisory Board (JAM-AB).
Chemistry (CY)	M.Sc. Chemistry	IITR	Chemistry for three years/six semesters	Mathematics	Chemistry for three years/ six semesters	The DFC discussed and agreed to drop compulsory mathematics at 10+2 level from the Minimum Educational qualification (MEQ) for students appearing in JAM 2018 for Chemistry. Department has already informed the decision on point (i) above. Regarding point (ii) it is inform you that the proposed format & qualifications are appropriate and we recommend no modification.

Geology (GG)	M.Sc. Applied Geology	IITR	Geology for three years/six semesters and any two subjects among Mathematics, Physic, Chemistry and Biological Science	Mathematics	Geology for three years/six semesters and any two subjects among Mathematics, Physic, Chemistry and Biological Science	The proposed format and qualifications are appropriate and recommendation is no modification.

<table>
<tr>
<td>- 57 - Mathematics (MA)</td>
<td>M.Sc. in Economics</td>
<td>IITR</td>
<td>Mathematics as one of the core subjects</td>
<td>No Restrictions</td>
<td>B.Tech/B.E./B.Sc.(PCM)/B.Stat and B.A./B.Com (with mathematics as one of the subjects in the whole programme).</td>
<td>Minimum qualification for admission to M.Sc. (Economic) programme include one of the following degree or their equivalents:
B.Tech/B.E./B.Sc.(PCM)/B.Stat and B.A./B.Com (with mathematics as one of the subjects) in the whole programme.
With reference to Point 2: The Department agrees with the recommendation that Minimum Educational Qualification (MEQ) for Indian Engineering students be removed and these students should be admitted on the basis of their JAM Rank only.
The department proposes that selection of students in the M.Sc. Economics programme [Code: 1806] should be ONLY on the basis of Mathematics (MA) test paper. Therefore, admission through Mathematical Statistics (MS) should be discontinued from JAM 2018 onwards. In this respect, the allocation of seats for Economics [1806] be revised as follows (on page 17 of JAM admission brochure):
<table>
<tr><td>M.Sc. (4 semesters)</td><td>Economics</td></tr>
<tr><td>[Programme code]
Seats Available</td><td>[1806] MA
15+8+5-2
ST(1)</td></tr>
<tr><td>Test Paper (Test Paper Code)</td><td>Mathematics (MA)</td></tr>
</table>
</td>
</tr>
</table>

	M.Sc. Mathematics	IITR	Mathematics for at least two years/four semesters	No Restrictions	Mathematics for at least two years/four semesters	In particular for admission in M.Sc. Mathematics programme at IIT Roorkee the MEQ for JAM 2018 is recommended as follows: (a) There is no restriction on subjects studied in 10+2 level. (b) Minimum Two Years/Four Semesters of Mathematics in Bachelor's Degree.
Mathematical Statistics (MS)	M.Sc. in Economics	IITR	Mathematics as one of the core subjects.		M.Sc. in Economics with Mathematical Statistics paper has been dropped and seats have been merged with Mathematics paper	-----
Physic (PH)	M.Sc. Physics	IITR	Physics for at least two years/four semesters and Mathematics for at least one year/two semesters	No Restrictions	Physics for at least two years/four semesters and Mathematics for at least one year/two semesters	No change is required in the present minimum educational qualification for admission in M.Sc.(Physic) through JAM

Item No. 69.22: To consider the proposal of permitting III year (IV year) students to register for one course of I year (II year) as back paper.

As per rule students of III year (IV year) are not allowed to register the courses of III year (IV year), if they have not completed the courses of I Yr (II Yr). However, in 2014, it was decided that these students be allowed to register with only one paper as back paper, provided they pay one semester fee as penalty and it was Rs.25000/- at that time. But now the fee has increased.

In 54th IAPC it was recommended that the penalty be kept fixed as Rs.25000/- as a deterrent to allow the students of **III year (IV year) to register courses with only one course of I Yr(II Yr) as back paper.**

The above recommendation is submitted for consideration and approval of the Senate.

Item No. 69.23: To consider Dress Code for various dignitaries/faculty members/graduating students at Convocation 2017 and onwards.

The Convocation 2017 committee in its first meeting held on July 03, 2017 discussed the issue of changing the dress code for dignitaries and graduating students.

1. The Senate may deliberate whether or not the dress code be changed.

2. In case the change in dress code is recommended, the decision can be taken by a committee constituted by the Director.

The issue is placed before the Senate for consideration and approval please.

Item No. 69.24: To consider holding of Annual Convocation of the Institute for the award of degrees to various graduating students on two days instead of one day as presently done.

The next convocation of the institute is scheduled to be held on September 23, 2017. The number of degree recipients is increasing every year (approximately 2300 in 2017) and it has become difficult to accommodate the present recipients (around 70% of total) and the guests in the convocation hall at one time. If all the candidates turn up to receive the degree in person, we will need a bigger hall to accommodate the degree recipients alone. We would need much more time for award of the degrees and other activities in the function. Moreover, parents of degree recipients do want to sit in convocation hall to see the proceeding live. At present this is not possible.

In view of the above, it is proposed that the convocation function be held on two days as follows:

Day - one: All undergraduate students, IDD programme students, Integrated M.Sc. programmes (1200 approximately).

Day - two: All Ph.D. and postgraduate candidates including MBA (1150 approximately).

These two days can be kept as successive days or spaced by one week.

This issue was also considered by the convocation committee in its meeting held on July 03, 2017. With this arrangement we may have to look for two chief guests.

The issue is placed before the Senate for consideration and approval please.

Item No. 69.25: To consider award of the Ph.D. Degrees to the students who have completed the requirements for the award of the Ph.D. Degree in various disciplines w.e.f. 3rd March 2017 to till date.

The list is presented as **Appendix 'A'.**

Appendix 'A'
Item No. Senate/69.25

S.No.	Name	Deptt.	Topic	Supervisor	Examiner (For./Ind.)	PDC Date
1	Mr. Rajanna S.	AHEC	INTEGRATED RENEWABLE ENERGY SYSTEM FOR A REMOTE RURAL AREA	Dr. R. P. Saini	Prof. Lejeune Andre, Belgium Prof. G. N. Tiwari, IIT Delhi	27.02.17
2	Mr. Amit Kumar	AHEC	GREEN HOUSE GAS EMISSIONS FROM HYDROPOWER RESERVOIRS AND ITS CATCHMENTS	Dr. M. P. Sharma	Prof. Nicola Fohrer, Inst. Natural Res., Germany Prof. K. P. Sudheer, IIT Madras	19.05.17
3	Ms. Vidushi	ASE	EXISTENCE AND UNIQUENESS RESULTS OF FRACTIONAL INITIAL BOUNDARY VALUE PROBLEMS	Dr. J. Dabas	Prof. S. K. Ntouyas, Univ. Ioannina, Greece Prof. DhrendraBahuguna, IIT Kanpur Prof. Rashmi Jain, MNIT Jaipur	31.03.17
4	Mr. Sunil Kumar Jauhar	ASE	OPTIMIZING THE SUSTAINABLE SUPPLY CHAIN PERFORMANCE THROUGH SOFT COMPUTING	Dr. Millie Pant	Prof. Hongbo Liu, Univ. Dalian Maritime, China Prof. P. C. Jha, Univ. of Delhi, Delhi Dr. P. K. Kapur, Amity Univ., Noida	03.07.17
5	Ms. Padmapriya K	BT	NMR-STRUCTURAL AND BIOPHYSICAL STUDIES ON INTERACTION OF ALKALOIDS WITH G-QUADRUPLEX DNA	Dr. R. Barthwal	Prof. N. B. Ulyanov, Univ. of California, USA Dr. A. Arora, CSIR Lucknow Prof. P. K. Sengupta, Univ. of Calcutta, Kolkata	03.03.17
6	Ms. PreetiVerma	BT	STUDIES ON ENZYMES INVOLVED IN PURINE NUCLEOTIDE METABOLISM	Dr. A. K. Sharma	Prof. Edward J. Collins, Univ. of Noth Carolina, USA Dr. A. K. Mohanty, NDRI Karnal Dr. Ram Kumar Dhaked, DRDO Gwalior	15.05.17
7	Ms. Pragati Agarwal	BT	STUDIES ON PRODUCTION AND APPLICATION OF L-TYROSINASE FROM ASPERGILLUS NIGER	Dr. R. P. Singh	Prof. L. Piergiovanni, Via Celario, Italy Prof S. K. Khare, IIT Delhi Prof. S. Agarwal, GBPUAT Pantnagar	04.07.17
8	Mr. VivekSinghal	CTRNS	ICT BASED ROAD VEHICLE-TRAIN COLLISION AVOIDANCE SYSTEM AT UNMANNED RAILWAY LEVEL CROSSING	Dr. S. S. Jain	Prof. A. Kumar, Australia Dr. P. K. Agarwal, MANIT Bhopal	29.03.17
9	Mr. Nitin Naresh Pandhare	CH	VAPOR PHASE HYDROGENOLYSIS OF GLYCEROL OVER NON-NOBLE METAL CATALYSTS	Dr. P. Biswas Dr. Shishir Sinha	Prof. Ajay K. Dalai , Univ. Saskatchewan, Canada Prof. GoutamDeo, IIT Kanpur Prof. K. K. Pant, IIT Delhi	16.03.17
10	Ms. Neetu Singh	CH	PHENOL AND CYANIDE REMOVAL FROM MONO AND BINARY SYNTHETIC SIMULATED AND REAL COKE WASTEWATE	Dr. C. B. Majumder	Prof. Sushanta K. Mitra, York Univ., Canada Prof. Debabrata Das, IIT Kharagpur	03.03.17
11	Mr. Umesh Kumar	CH	SIMULATION OF BIOMASS GASIFICATION IN A FLUIDIZED BED REACTOR USING CFD	Dr. V. K. Agarwal	Prof. S. A. Sherif, Univ. of Florida, USA	01.06.17

Appendix 'A'
Item No. Senate/69.25

12	Mr. NilambarBariha	CH	FIRE AND EXPLOSION ANALYSIS INVOLVING LPG AND LNG	Dr. V. C. Srivastava Dr. I. M. Mishra	Prof. Roberto Bubbico, Roma Italy Prof. S. Jayanti, IIT Madras Prof. A. K. gupta, IIT Kharagpur	11.05.17
13	Mr. Deepak Sahu	CH	INVESTIGATION ON LIQUID FUEL FIRES IN A COMPARTMENT	Dr. Shashi Dr. Akhilesh Gupta Dr. Shorab Jain	Prof. Suresh Kumar, Wembley, UK Dr. Meenakshi Gupta, DRDO Delhi	25.04.17
14	Ms. Shubhrajyotsna Bhardwaj	CY	SYNTHESIS OF CHELATING IONOPHORES AND THEIR ANALYTICAL APPLICATION AS OPTICAL CHEMICAL SENSOR	Dr. A. K. Singh	Prof. R. Paolesse, Univ of Rome, Italy Prof. Monika Datta, Univ. of Delhi, Delhi Prof. S. K. Singh, BHU Varanasi	17.03.17
15	Ms. Rachna Sharma	CY	DOUBLE METAL CYANIDES AND THEIR ROLE AS PREBIOTIC CATALYST	Dr. Kamaluddin	Prof. K. Kobayashi, Yokohama National Univ., Japan Prof. JaoDeo Singh, IIT Delhi Prof. Tarasankar Pal, IIT kharagpur	22.02.17
16	Ms. Preeti	CY	SYNTHESIS OF *N, S*-HETEROCYCLES *VIA* MULTICOMPONENT APPROACH	Dr. Anuj Sharma	Prof. C. Hulme, Univ. Arizona, USA Prof. Nand Kishore, IIT Bombay Dr. D. K. Mahapatra, NPCD Hyderabad	12.06.17
17	Ms. DebasmitaSaha	CY	CONTEMPORARY SYNTHESIS OF PRIVILEGED DIBENZOTHIAZEPINE DERIVATIVES	Dr. Anuj Sharma	Prof. C. Hulme, Univ. Arizona, USA Prof. P. K. Sharma, Kurukshetra Univ., Krukshetra Dr. D. K. Mahapatra, CSIR Hyderabad	12.06.17
18	Mr. Ambika Kumar	CY	STUDIES ON CADMIUM SULPHIDE QUANTUM DOTS FOR HEAVY METAL DETECTION	Dr. R. K. Dutta	Prof. P. V. Kamat, Notre Dame Univ., USA Prof. A. chattopadhyay, IIT Guwahati Prof. Taranskar Pal, IIT Kharagpur	15.06.17
19	Ms. Mandeep Kaur Chahal	CY	DESIGN OF PORPHYRINOID AND 1,8-NAPHTHYRIDINE HOSTS FOR FLUORIDE, CYANIDE AND PICRIC ACID SENSING	Dr. M. Shankar	Prof. K. M. Kadish, Univ. of Houston, USA Prof. A. Srinivasan, NISER Bhubaneswar Prof. M. Ravikanth, IIT Bombay	15.06.17
20	Ms. Rama Gaur	CY	SYNTHESIS OF METAL SULFIDE NANOPARTICLES AND STUDIES ON THEIR OPTICAL PROPERTIES	Dr. P. Jeevanandam	Prof. Paresh C. Ray, Jackson State Univ., USA Prof. M. Eswaramoorty, CPMU Bangalore	25.06.17
21	Mr. Md. Asif Iqubal	CY	STUDIES ON METAL FERRITES AS PREBIOTIC CATALYST	Dr. Kamaluddin	Prof. Kensei Kobayashi, Japan Prof. S. K. Chakrabarti, SNBNCBS, Kolkata Prof. A. T. Khan, Aliah Univ., Kolkata	28.06.17
22	Mr. Ashish K. Dhara	CY	STUDIES ON SOME TRANSITION METAL CHELATES	Dr. K. Ghosh	Dr. A. Rosato, Italy Prof. A. R. Chakravarty, IISC Bangalore Prof. G. K. Lahiri, IIT Bombay	13.04.17
23	Ms. Lata Rana	CY	SYNTHESIS, REACTIVITY AND CATALYTIC ACTIVITY OF MOLYBDENUM AND TUNGSTEN COMPLEXES	Dr. M. R .Maurya	Prof. K. Woo, Iowa State Univ., USA Prof. D. K. Chand, IIT Madras Prof. S. Pal, Univ. of Hyderabad	14.04.17
24	Mr. Pankaj Gupta	CY	NANOCOMPOSITE BASED SENSORS FOR VOLTAMMETRIC DETECTION OF BIOMOLECULES & DRUGS	Dr. R. N. Goyal	Prof. G. D. Christian, Univ. Washington, USA Dr. V. K. Pillai, Director, CERI Karaikudi Prof. A. Q. Contractor, Dhofar Univ., Oman	19.04.17

25	Ms. Neha Gupta	CY	SYNTHESIS AND ANALYTICAL APPLICATIONS OF SOME IONOPHORES AS ION SENSORS	Dr. A. K. Singh	Prof. J. A. Ortuno, Univ. Murcia, Spain Prof. Lal Bahadur, BHU Varanasi Prof. S. Jain, Univ Lucknow, Lucknow	20.04.17
26	Ms. DivyaSinghal	CY	ELECTROANALYTICAL AND OPTICAL STUDIES OF SOME CHELATING LIGANDS AS CHEMICAL SENSORS	Dr. A. K. Singh	Prof. J. A. Ortuno, Univ. Murcia, Spain Prof. G. Pandey, IMSC Lucknow Prof. M. M. Singh, BHU Varanasi	27.04.17
27	Ms. Pinky Yadav	CY	SYNTHESIS AND APPLICATIONS OF FUNCTIONALIZED CORROLES AND PORPHYRINS	Dr. M. Shankar	Prof. C. Gros, Dijon Cedex, France Prof. S. P. Rath, IIT Kanpur Dr. M. Ravikanth, IIT Bombay	31.05.17
28	Mr. Merugu Suresh	CE	COLORIMETRICALLY IMPROVED CLASSIFICATION ACCURACY	Dr. Kamal Jain	Prof. Xuan Zhu, Monash Univ., Australia Dr. K. R. M. Rao, PNSRU, Hyderabad	17.03.17
29	Mr. Souvik Chakraborty	CE	A MULTILEVEL PARADIGM FOR STOCHASTIC COMPUTATIONS	Dr. R. Chowdhury	Prof. Carsten Proppe , Germany Dr. A. Chakraborty, IIT Guwahati Prof. B. N. Rao, IIT Madras	07.03.17
30	Mr. Mithun Mohan	CE	ANALYSIS OF MIXED TRAFFIC FLOW AT UNCONTROLLED INTERSECTIONS	Dr. M. Parida Dr. Satish Chandra	Prof. P. Savolainen, Lowa Univ., USA Prof. Sudip K. Roy, IIEST Shibpur	27.02.17
31	Mr. Md. Muslim Ansari	CE	BEHAVIOUR OF FRP LAMINATED COMPOSITE PLATES UNDER IMPACT LOADING	Dr. A. Chakrabarti	Prof. S. Adhikari, Swansea Univ., UK Prof. Puneet Mahajan, IIT Delhi Prof. Yogesh M. Desai, IIT Bombay	11.06.17
32	Mr. RathodRavindraRamkishan	CE	SPATIAL DATA MINING METHODS FOR ELECTRICITY CONSUMPTION PROFILING	Dr. R. D. Garg	Prof. A. Sharma, Australia Dr. S. Saran, ISRO Dehradun	07.06.17
33	Mr. Shakeel Ahmad Waseem	CE	SHEAR FRICTION IN RCA CONCRETE	Dr. Bhupendra Singh	Prof. N. Banthia, Britih Columbia Univ., Canada Dr. Davdas Menon, IIT Madras	14.04.17
34	Ms. Deepti Yadav	CE	APPROACHES FOR DETECTION AND IDENTIFICATION OF TARGETS USING REMOTE SENSING DATA	Dr. M. K. Arora Dr. J. K. Ghosh Dr. K. C. Tiwari	Prof. Stefan A. Robila, Montclair State Univ., USA Prof. Krishan Mohan Buddhirju, IIT Bombay	19.06.17
35	Mr. Abhishek Jindal	CE	INCLUSION OF RECYCLED CONCRETE AGGREGATES AND MINERAL ADMIXTURES IN PQC MIX	Dr. g. D. Ransinchung R. N.	Prof. I. Yoshitake, Japan Prof. I. K. Pateriya, MRD, New Delhi Dr. Brind Kumar, IIT (BHU) Varanasi	20.06.17
36	Mr. Franklin F. R. Frederick	CE	SHEAR STRENGTHENING OF REINFORCED CONCRETE ELEMENTS	Dr. Umesh Kumar Prof. V. K. Gupta	Prof. M. Gillie , Univ. of Manchester, UK Prof. S. K. Bhattacharyya, IIT Kharagpur Prof. B. K. Raghu Prasad, IISc Bangalore	21.06.17
37	Mr. Abhishek Rajput	CE	BEHAVIOUR OF PRESTRESSED CONCRETE PLATES UNDER HIGH RATE OF LOADING	Dr. Mohd. A. Iqbal	Prof. Chengqing Wu, NSW Australia Prof. R. Velmurugan, IIT Madras	23.06.17
38	Mr. Sunil K. Sharma	CTS	MODELLING AND ANALYSIS OF INDIAN RAIL VEHICLE	Dr. Anil Kumar	Prof. O. S. Bursi, Trento, Italy Prof. P. Yammiyavar, IIT Guwahati Prof. N. D. S. Kumar, IISc Bangalore	11.04.17
39	Ms. Pritikana Das	CTS	MACROSCOPIC PEDESTRIAN FLOW	Dr. V. K. Katiyar	Dr. A. Bhaskar, Queensland Univ. Tech., Australia	31.05.17

			MODELLING AND DEVELOPMENT OF LEVEL OF SERVICES		Dr. G. J. Joshi, SVNIT Surat Dr. M. Advani, CSIR New Delhi	
40	Ms. AmitaJohar	CTS	PUBLIC TRANSPORT SYSTEM PLANNING AND OPERATION USING GEOSPATIAL TECHNIQUES	Dr. S. S. Jain Dr. P. K. Garg	Prof. Erika Buchari, Sriwijaya Univ., Indonesis Prof. S. K. Roy, IIEST Shibpur Prof. S. K. Katiyan , MANIT Bhopal	28.02.17
41	Mr. Sanjay Singh Negi	ES	UNDERSTANDING THE CRUSTAL STRUCTURE OF GARHWAL-KUMAUN HIMALAYA	Dr. Kamal Dr. Ajaya Paul	Prof. Edi Kissling, ETH Zurich Switzerland Prof. Malay Mukul, IIT Bombay Prof. J. R. Kayal, Kolkata	11.05.17
42	Mr. Rahul Dehiya	ES	3D MODELLING AND INVERSION OF CONTROLLED-SOURCE ELECTROMAGNETIC DATA	Dr. P. K. Gupta Dr. Israil	Prof. Ute Weckmann, Germany Prof. Shalivahan, IISM Dhanbad	25.05.17
43	Ms. MandiraMajumder	ES	SEISMIC RESPONSE OF A FRACTURED LAYER	Dr. V. N. Singh Dr. Anand Joshi	Prof. JyotiBehura, CSM, USA Prof. W. K. Mohanty, IIT Kharagpur Dr. G. Mohan, IIT Bombay	13.06.17
44	Mr. Pradeep Muley	EQ	ASSESSMENT OF LIQUEFACTION POTENTIAL USING IN-SITU AND LABORATORY TESTS	Dr. B. K. Maheshwari Dr. D. K. Paul	Prof. Hesham El Nagar, Western Univ., Canada Prof. Ashish Juneja, IIT Bombay Prof. A. Boominathan, IIT Madras	01.05.17
45	Mr. Imteyaz Ansari	EQ	EVALUATION OF DAMAGE INDICES FOR RISK ASSESSMENT OF CONCRETE GRAVITY DAMS	Dr. Pankaj Agarwal	Prof. A. Ghobarah, MCMaster Univ., Canada Prof. S. K. Deb, IIT Guwahati	03.05.17
46	Mr. BabluKirar	EQ	DYNAMIC STRENGTH CHARACTERISTICS OF REINFORCED SANDS	Dr. B. K. Maheshwari Dr. R. S. Jakka	Prof. M. H. Elnaggar, Western Ontario Univ., Canada Prof. T. G. Sitharam, IISc Bangalore	28.02.17
47	Mr. Om Hari Gupta	EE	PROTECTION ASPECTS OF TRANSMISSION LINE AND MICROGRID IN THE PRESENCE OF SWITCHING DEVICES	Dr. ManojTripathi	Prof. T. Sidhu, Ontario Institute Univ., Canada Prof. A. K. Pradhan, IIT Kharagpur	14.03.17
48	Mr. Jitendra Kumar	EE	ADAPTIVE DISTANCE RELAYING FOR POWER NETWORKS	Dr. Premalata Jena	Prof. T. S. Sidhu, Univ. Ontario, Canada Prof. Sukumar Mishra, IIT Delhi Prof. Ashwani Kumar, NIT Kurukshetra	29.03.17
49	Mr. Patel BhavikRajnikant	EE	FACE IMAGE ANALYSIS FOR SOFT BIOMETRIC CLASSIFICATION	Dr. R .P. Maheshwari Dr. B. Raman	Prof. KidiyoKpalma, France Prof. P. Gupta, NITTTR Kolkata Prof. S. Agarwal, MNIT Allahabad	03.05.17
50	Mr. Harikrishna Muda	EE	ADAPTIVE PROTECTION SCHEMES FOR MICROGRID ENVIRONMENT	Dr. Premalata Jena	Prof. V. K. Sood, Univ. Ontario, Canada Dr. S. Chakrabarti, IIT Kanpur	31.05.17
51	Mr. Gaurav Singh Baghel	E&CE	INVESTIGATIONS ON MULTI-FREQUENCY HIGH POWER GYROTRON OSCILLATORS	Dr. M. V. Kartikeyan	Prof. Toshitakaldehara, Univ. of Fukui, Japan Prof. P. K. Jain, IIT (BHU) Varanasi Dr. R. K. Sharma, CSIR Rajasthan	15.05.17
52	Ms. Archana Pandey	E&CE	IMPACT OF FINFET PARASITIC EFFECTS IN CIRCUIT DESIGN	Dr. AnandBulusu	Prof. Niraj K. Jha, Princeton Univ., USA Prof. ShreepadKarmalkar, IIT Madras	27.06.17
53	Mr. LeeladharMalviya	E&CE	SOME STUDIES ON MIMO	Dr. M. V. Kartikeyan	Prof. N. C. Karmakar, Monash Univ.,Victoria	13.06.17

			ANTENNAS WITH DIVERSITY TECHNIQUES FOR WIRELESS APPLICATIONS	Dr. R. K. Panigrahi	Prof. K. C. James Raju, Univ. of Hyderabad, Hyderabad Prof. Pradip K. Jain, IIT (BHU) Varanasi	
54	Mr. Amit Kumar Giri	HSS	LABOUR CONDITIONS IN THE EXPORT ORIENTED HANDKNOTTED CARPET INDUSTRY IN INDIA	Dr. S. P. Singh	Prof. Thomas O'Neill, Canada Prof. P. Jha, JNU New Delhi Prof. B. Singh Tiwana, Punjab Univ. Patiala	08.04.17
55	Ms. ShilpiTyagi	HSS	R&D, PROFITABILITY, AND EXPORT PERFORMANCE OF INDIAN DRUG AND PHARMACEUTICAL INDUSTRY	Dr. D. K. Nauriyal	Prof. J. Goddard, Bangor Univ., UK Prof. V. Upadhyay, IIT Delhi Prof. P. Trivedi, IIT Bombay	14.04.17
56	Ms. Averi Mukhopadhyay	HSS	NARRATIVES OF DISSENT AND DISCONTENT: A SELECT STUDY OF CONTEMPORARY AMERICAN AND INDIAN CAMPUS NOVELS	Dr. Rashmi Gaur	Prof. M.Maniruzzaman, Jahangirnagar Uni., Bangladesh Dr. R. Singh, IIT Dhanbad	15.05.17
57	Mr. Amit Sanger	IIC	NANOSTRUCTURED THIN FILMS FOR GAS SENSING AND ENERGY STORAGE APPLICATIONS	Dr. Ramesh Chandra	Prof. A. Tiwari,Salt Lake City, USA Dr. S. Kumar, CSIR-NPL, Delhi Prof. Hitendra K. Malik, IIT Delhi	25.05.17
58	Ms. AnugaminiPriya	DoMS	AUTHENTIC LEADERSHIP AS A PREDICTOR OF SCHOOL TEACHER'S EXTRA ROLE BEHAVIOR	Dr. R. L. Dhar	Prof. R. Rahimi, Wolverhampton Business Univ., UK Prof. Rajiv Khosla, Chandigarh Univ., Chandigarh	27.03.17
59	Mr. Deepak Sangroya	DoMS	ANTECEDENTS & CONSEQUENCES OF CUSTOMER VALUE IN RENEWABLE ENERGY SECTOR	Dr. J. K. Nayak	Prof. C. T. Sun, Hong Kong Univ., Hong Kong Prof. N. K. Sharma, Kanpur	12.04.17
60	Mr. VinayakVishwakarma	DoMS	SUPPLY CHAIN PERFORMANCE AND RISK ASSESSMENT IN THE PHARMACEUTICAL INDUSTRY	Dr. M. K. Barua	Prof. Kaushik V. Pandya, Sheffield Hallam Univ., UK Prof. K. Mukherjee, IIMK Kashipur	12.04.17
61	Ms. Monika	DoMS	DETERMINANTS OF VENTURE CAPITALISTS' INVESTMENT DECISIONS IN INDIA	Dr. A. K. Sharma	Prof. DeistingFlorent, France Prof. Surendra S. Yadav, IIT Delhi Prof. P. Rajib IIT Kharagpur	19.04.17
62	Ms. Binita Tiwari	DoMS	TALENT DEVELOPMENT AND ENGAGEMENT OF SURVIVORS: A STUDY OF IT/ITES SECTOR IN INDIA	Dr. Usha Lenka	Dr. Aimee Hampel-Milagrosa, Germany Prof. T. J. Kamalanabhan, IIT Madras	25.07.17
63	Mr. Neeraj Kumar Jaisal	DoMS	SERVANT LEADERSHIP AS A PREDICTOR OF INNOVATIVE BEHAVIOR	Dr. R. L. Dhar	Prof. A. Assaf, United State Dr. S. Singh, ISM Dhanbad	15.05.17
64	Mr. VirendraBalon	DoMS	GSCM: THE ASSESSMENT OF PRESSURE, PRACTICE, AND	Dr. A. K. Sharma Dr. M. K. Barua	Prof. DamodarGolhar, West Michigan Univ., USA Prof. N. K. Sharma, Kanpur	25.05.17

			PERFORMANCE IN INDIAN AUTOMOBILE INDUSTRY			
65	Mr. RavinderKatta	MA	ILL POSED PROBLEMS AND CONTROLLABILITY OF CONTROL SYSTEMS	Dr. N. Sukavanam	Prof. S. Pereverzyev, Johann-Radon-Institute, Austria Prof. DhrendraBahuguna, IIT Kanpur Prof. Raju K. George, IIST Kerala	20.03.17
66	Mr. Amreek Singh	MA	AN IMPROVED ABC ALGORITHM AND ITS GPU AIDED APPLICATION FOR AVALANCHE FORECASTING	Dr. Kusum Deep	Prof. Ferrante Neri , De Montfort Univ., UK Prof. VanitaVerma, PU Chandigarh Dr. Rajesh Kumar, MNIT Jaipur	22.02.17
67	Ms. Komal Gupta	MA	**DYNAMICAL BEHAVIOR OF SOME CONTINUOUS AND FILIPPOV TYPE ECOLOGICAL MODELS**	Dr. SunitaGakkhar	Prof. Jia Li, USA Prof. P. Chandra, Vadodara Prof. Amiya K. Pani, IIT Bombay	31.05.17
68	Ms. Vanita Garg	MA	DESIGN AND APPLICATIONS OF BIOGEOGRAPHY BASED OPTIMIZATION	Dr. Kusum Deep	Prof. R. A. Formato, USA Prof. P. C. Jha, Delhi Univ., Delhi Prof. K. S. Swarup, IIT Madras	03.05.17
69	Mr. AnojGiri	MA	**SOME STUDIES ON NEAR SURFACE AND THROUGH THICKNESS RESIDUAL STRESS IN STAINLESS STEEL WELD**	Dr. M. M. Mahapatra	Prof. Leijun Li, Canada Prof. D. S. Nagesh, DTU Delhi	06.07.17
70	Mr. Jani DilipBatukray	MIE	PERFORMANCE STUDY OF A SOLID-DESICCANT VAPORCOMPRESSION HYBRID AIR-CONDITIONING SYSTEM	Dr. Manish Mishra Dr. P. K. Sahoo	Prof. Tariq Munner, Edinburgh Napier Univ., UK Dr. Prabal Talukdar , IIT Delhi Dr. Shaligram Tiwari, IIT Madras	20.03.17
71	Mr. Nav Rattan	MIE	EXPERIMENTAL INVESTIGATIONS INTO TRAVELLING WIRE ELECTROCHEMICAL SPARK MACHINING PROCESS	Dr. R. S. Mulik	Prof. JA McGeough , Univ. Edinbugh, UK Dr. P. M Pandey, IIT Delhi Prof. V. K. Jain, IIT Kanpur	03.03.17
72	Mr. Shivraman	MIE	FRICTION STIR PROCESSING OF Ni-Al-BRONZE FOR IMPROVED MECHANICAL AND TRIBOLOGICAL PROPERTIES	Dr. D. K. Dwivedi	Prof. D. M. E. Rodrigues, Portugal Prof. S. Aravindan, IIT Delhi Prof. A. K. Nath, IIT Kharagpur	13.07.17
73	Mr. PashamNithish Reddy	MIE	STUDY OF DOUBLE DIFFUSIVE CONVECTION IN ENCLOSURES	Dr. K. Murugesan	Prof. P. Nithiarasu, Swansea Univ., UK Prof. Kannan Lyer, IIT Bombay Prof. K. N. Seetharamu, PESIT Bangalore	12.04.17
74	Mr. Subhash Singh	MIE	SPECIALITY ALUMINIUM MMCS WITH UNMODIFIED AND MODIFIED SIC FOR HIGH PERFORMANCE APPLICATION	Dr. Kaushik Pal	Prof. A. Urena Fernandez, Madrid Spain Prof. U. Ramamurty, IISc Bangalore Prof. B. S. Murty, IIT Madras	26.04.17
75	Mr. Shedbale Amit Subhash	MIE	SIMULATION OF INDENTATION, DAMAGE AND CRACK GROWTH USING COUPLED FE–EFG APPROACH	Dr. I. V. singh	Prof. TimonRabczuk, Bauhaus Univ., Germany Prof. B. Nageswara Rao, IIT Madras	01.05.17

76	Mr. Kamal Kumar	MIE	SOME STUDIES ON SCHEDULING OF RECONFIGURABLE MANUFACTURING SYSTEM	Dr. P. K. Jain Dr. Dinesh Kumar	Prof. S. Nahavandi, Deakin Univ., Australia Prof. M. K. Tiwari, IIT Kharagpur Prof. Ravi Shankar, IIT Delhi	01.05.17
77	Mr. Ashok Kumar Dewangan	MIE	ENHANCEMENT OF HEAT TRANSFER DURING POOL BOILING OF REFRIGERANTS	Dr. Anil Kumar	Prof. A. Miyara , Saga Univ. Japan Prof. Sanjeev Jain, IIT Delhi Prof. C. Balaji, IIT Madras	29.05.17
78	Mr. R. Sunil Kumar	MME	DEVELOPMENTOF HIGH TEMPERATURE ODS STEELS BY POWDER FORGING	Dr. Ujjwal Prakash Dr. V. Dabhade	Prof. Eric A. Jaegle, Max-Planck-Institutfür Eisenforschung GmbH, Germany Dr. P. Ramakrishnan (Retd.), Mumbai	15.03.17
79	Mr. Dasharath S. Mubrukar	MME	MECHANICAL PROPERTIES OF UFG LOW SFE CU-ZN & CU-AL ALLOYS PROCESSED BY CRYO-ROLLING/FORGING	Dr. SuhritMula	Prof. C. Suryanarayana, Central Florida Univ., USA Prof. I. Samajdar, IIT Bombay Prof. B. S. Murty, IIT Madras	14.03.17
80	Ms. DevasriFuloria	MME	MECHANICAL BEHAVIOUR AND MICROSTRUCTURAL EVOLUTION OF UFG ZIRCALOY-4	Dr. R. Jayaganthan	Prof. S. Kamal, Mekelle Univ., Ethiopia Prof. N. K. Mukhopadhyay, IIT (BHU) Varansi	03.03.17
81	Mr. Nikhil Kumar	MME	FATIGUE & FRACTURE STUDIES ON ULTRAFINE GRAINED 6082 AL ALLOY	Dr. R. Jayaganthan	Prof. R. Shabadi , Univ. de Lille, France Dr. S. Aravindan, IIT Delhi	28.02.17
82	Mr. Kaushal Kumar	MME	STRUCTURE-PROPERTY CORRELATIONS OF INORGANIC NANOPARTICLE FILLED EPOXY COMPOSITE	Dr. P. K. Ghosh	Prof. Thomas Ummenhofer, Germany Prof. P. Maiti, IIT (BHU) Varanasi	02.06.17
83	Ms. MandeepKaloti	NT	SYNTHESIS AND MULTIFUNCTIONAL APPLICATIONS OF BIOMOLECULE-MEDIATED Ag-y-Fe_2O_3γ NANOHYBRIDS	Dr. Anil Kumar Dr. N. K. Navani	Prof. Jeffery L. Coffer, Texas Christian Univ., USA Prof. A. Chattopadhyay, IIT Guwahati Prof. H. B. Bohidar, JNU, New Delhi	10.03.17
84	Ms. SowjanyaMotana	NT	OPTICAL PROPERTIES OF ZnO NANOSTRUCTURED THIN FILMS: EXPERIMENTS AND SIMULATION STUDIES	Dr. R. Jayaganthan Dr. Rajib Chowdhury	Prof. Sun Kyu Kim, Univ. of Ulsan, Korea Prof. PerumalAlagarsamy, IIT Guwahati Prof. R. Sarathi, IIT Madras	03.03.17
85	Ms. Paramjit Kaur	PH	OPTICAL PROPERTIES OF MULTI-LEVEL ATOMIC SYSTEMS UNDER EIT AND EIA CONDITIONS	Dr. Ajay Wasan	Prof. E. Arimondo, Univ. 56127 Pisa, Italy Prof. Suneel Singh, Univ. Hyderabad, Hyderabad Prof. Vasant Natarajan, IISc Bangalore	21.03.17
86	Mr. Rahul Barman	PH	MULTIFERROIC THIN FILMS: GROWTH, CHARACTERIZATION AND APPLICATION	Dr. D. Kaur	Prof. Pivin J. C., France Prof. Sujeet Chaudhary, IIT Delhi Prof. R. P. Tandon, New Delhi	19.04.17
87	Ms. MeeraRawat	PH	INVESTIGATION OF STRUCTURAL AND ELECTRICAL PROPERTIES OF LEAD FREE CERAMICS	Dr. K. L. Yadav	Prof. H. Takeda,Japan Dr. A. R. James, DRDO Hyderabad	19.05.17
88	Mr .Om Prakash Verma	PPE	ENERGY OPTIMIZATION OF HEPTADS' STAGE EVAPORATOR VIA MODELING, SIMULATION &	Dr. G. Manik	Prof. Ajit Abraham, USA Dr. M. C. Ramteke, IIT Delhi Prof. R. S. Singh, IIT (BHU) Varanasai	10.07.17

			CONTROL			
89	Mr. Santosh Kumar Yadav	ASE	PARTITION OF INDIA: A HISTORICAL-LITERARY STUDY	Dr. S. K. Mishra Dr. Nagendra Kumar	Prof. P. Olga V., Volga State Univ., Russia Prof. K. Kapoor, Delhi Prof. G. Neelakantan, IIT Kanpur	18.07.17
90	Mr. Virendra Kumar	HSS	AN ASSESSMENT OF PRIMARY HEALTH CARE DELIVERY SYSTEM IN A DISTRICT OF UTTAR PRADESH	Dr. A. J. Mishra	Prof. K. V. Rao, USA Prof. Sunita Reddy, JNU Delhi Prof. Himanshu Rai, IIM Lucknow	20.07.17

Item No. 69.26: To consider the proposal for Senate Standing Committee for Scholarships and Prizes for students.

Dean of Resources & Alumni Affairs (DORA) office has been receiving requests from donors for awards like the best all-rounder of a particular department, awards for excellence in communication skills, awards for services to the rural population of the country, awards for achievements in sports etc. Unlike purely CGPA based achievements, such scholarships and prizes need deliberations to define the criteria and selection process. A Senate Committee for Scholarships and Prizes (SCSP) is being proposed to formulate such proposals and present them to the Senate for consideration. For all urgent and pending cases, the committee may seek Chairman, Senate's approval and report such approvals to the Senate. This mechanism will also provide a single window instead of the current practice of instituting scholarships and prizes through multiple Deans' offices. It will also ensure that all such initiatives become part of the Senate's records. The committee will also oversee the process for the selection of awardees each year, including those for existing awards which are given at the time of Convocation, or otherwise.

SCSP would have a tenure of one year and would consist of

(1) Chair – to be nominated by Chairperson, Senate
(2) Two faculty members to be nominated by the Departments (on rotation basis considering departments' name alphabetically)
(3) Two students' representatives:

    (i) General Secretary (Academic Affairs) or his/her nominee
    (ii) General Secretary (Alumni Affairs) or his/her nominee

Whenever required, DORA and outgoing Chair SCSP will contribute to SCSP as special invitees. For specific awards, SCSP will be free to constitute appropriate committees for selecting awardees.

SCSP would also look at the various issues with existing scholarships and prizes like the need for their

rationalization, examining the feasibility of their continuation, enhancement of amount etc. Further, donors often enquire about the possibility of instituting a new scholarship or prize. This committee will be expected to keep a list of new potential scholarships and prizes ready, which future donors may consider to support.

Senate is requested to consider and approve the proposed Senate Committee for Scholarships and Prizes (SCSP).

Item No. 69.27: To report the syllabi of M.Tech. (Photonics) proposed by the Physics Department.

On the recommendation of the 54th IAPC, the Chairman Senate approved the following syllabi of M.Tech. (Photonics) proposed by the Physics Department **(Appendix 'A')**:

1. PHN-701: Numerical Analysis and Computational Techniques.
2. PHN-703: Fabrication and Characterization Techniques
3. PHN-707: Laboratory Work in Solid State Electronic Materials
4. PHN-709: Semiconductor Device Physics
5. PHN-711: Laboratory Work in Photonics
6. PHN-715: Analog Integrated Circuit Design
7. PHN-717: Digital Signal Processing

The above is reported to the Senate.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-701** Course Title: **Numerical Analysis and Computational Techniques**

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

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

4. Relative Weightage: **CWS: 20** **PRS: 20** **MTE: 20** **ETE: 40** **PRE: 0**

5. Credits: **3** 6. Semester: **Autumn** 7. Subject Area: **PCC**

8. Pre-requisite: **Nil**

9. **Objective of Course:** To provide the knowledge of computation with suitable mathematical software and its applications to solve the problems of condensed matter physics.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Introduction to mathematical software/language:** Concept of programming in Matlab/Mathematica, input/output, interactive input, loading and saving data, loops, branches and control flow, matrix and array operations, eigenvalues and eigenvectors.	6
2.	**Sub programs:** Array of dimensional variables, subroutines, sub-programming, functions sub-programming, Advantages of modular programming, built-in functions, scripts, functions, sharing of variables between modules.	5
3.	**Graphics:** 2D plots, style options, axis control, overlay plots, subplot, histogram, 3D plots, mesh and surface plots, contour plots.	4
4.	**Numerical computation:** Computer programs for: solving linear system of simultaneous equations, nonlinear algebraic equation, roots of polynomials, curve fitting, polynomial curve fitting, least square curve fitting, interpolation, data analysis and statistics. Numerical integration, Quadrature, Monte-Carlo simulation, ordinary differential equation, first order and second order ODEs, partial differential equation methods (the finite difference method & the finite element method).	13
	Total	**28**

11. Suggested Books:

S. No.	Name of Authors/Book/Publisher	Year of Publication/Reprint
1.	Pratap, R., "Getting started with MATLAB 7", Oxford University Press.	2006
2.	Gilat, A., "Matlab: An Introduction with Applications", Wiley.	2008
3.	Tao, P., "Computational Physics", Cambridge University Press.	2005
4.	David, P., "Computational Physics", John Wiley & Sons	1973
5.	Wolfram, S., "The Mathematica Book," 5th Ed., Wolfram Media	2003
6.	Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 7th Ed, Addison Wesley	2003

S. No.	List of Experiments
1.	Eigen-value problem: 1-D square potential well
2.	Stochastic methods for multidimensional integrals
3.	Study of systems with chaotic dynamics
4.	Solving Kronig-Penny Model
5.	Study of doping profile in semiconductors
6.	Variation of dielectric constant for composite materials
7.	Calculation of modes of an optical waveguide
8.	Monte-Carlo simulations (Ising Model of magnetism)
9.	Molecular Dynamics Simulations

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-703** Course Title: **Fabrication and Characterization Techniques**
2. Contact Hours: **L: 3** **T: 0** **P: 0**
3. Examination Duration (Hrs.): **Theory: 3** **Practical: 0**
4. Relative Weightage: **CWS: 25** **PRS: 0** **MTE: 25** **ETE: 50** **PRE: 0**
5. Credits: **3** 6. Semester: **Autumn** 7. Subject Area: **PCC**
8. Pre-requisite: **Nil**
9. Objective: To familiarize fabrication and characterization of electronic and photonic materials devices
10. Details of Course:

S. No.	*Contents*	Contact Hours
1.	**Lithography:** Patterning, various kinds of resists, Spin Coating, Soft bake, Lithography techniques (Photo, E-beam, X-ray), Exposure, Resolution, Contact Aligners, Projection Aligners, Multiple stage lithography, Development, Post-development, Resist removal.	6
2.	**Additive Techniques:** Crystallography, Thermodynamics of Material Growth, Kinetics and Nucleation; Grain growth, Physical Vapor Deposition, Evaporation (Thermal, E-beam), Sputtering (DC, RF), Cosine Law of Deposition, Doping of Si, Oxidation of Si, Chemical Vapor Deposition, ion-exchange method, Pulse laser deposition	12
3.	**Dry Etching Techniques:** Overview, Dry Etching, Diode Plasmas, Triode Plasmas, DC Plasmas (Diode discussion), Physical Etching, Plasma Etching, Physical / Chemical Etching, RF Plasmas (Diode), Triode Configuration, Deep Reactive Ion Etching (DRIE), Reaction Mechanisms in Dry Etching	8
4.	**Wet Etching Techniques:** Wet Isotropic and Anisotropic Etching of Si, Etching with Bias and/or Illumination of the Semiconductor, Etch-stop techniques, Issues in Wet Bulk Etching	6
5.	**Characterization:** Structural characterization: X-ray Diffraction, X-ray Reflectivity, RHEED. Microscopy: Optical Microscopy: Scanning Electron Microscopy, Atomic Force Microscopy. Electrical Transport Characterization, Chemical characterization; Optical Characterization: Ellipsometer, Prism Coupling Method, Spectro-photometer.	10
	Total	42

11. Suggested Books:

S. No.	Name of Authors/Book/Publisher	Year of Publication/Reprint
1.	Milton Ohring , "Materials Science of Thin Films", Second Edition, Elsevier	2001
2.	Ludwig Reimer, "Scanning Electron Microscopy Physics of Image Formation and Microanalysis", Second Edition, Springer	1998
3.	Harry J. Levinson, "Principles of Lithography", Second Edition, SPIE Press	2005
4.	Chris Mack, "Fundamentals of Microfabrication The Science of Miniaturization", Second Edition, CRC Press	2002
5.	Harland G. Tompkins, "Handbook of Ellipsometry", William Andrew Publishing, Springer-Verlag GabH & Co. KG	2005
6	Ayahiko Ichimiya and Philip I. Cohen, "Reflection High-Energy Electron Diffraction", CAMBRIDGE	2004
7	Jens Als-Nielsen, Des McMorrow, "Elements of Modern X-ray Physics" Second Edition, Wiley	2011
8	Sami Franssila, " Introduction to Microfabrication" Second Edition, Wiley	2010

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-707** Course Title: **Laboratory Work in Solid State Electronic Materials**

2. Contact Hours: **L: 0** **T: 0** **P: 6**

3. Examination Duration (Hrs.): **Theory: 0** **Practical: 6**

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

5. Credits: **3** 6. Semester: **Autumn** 7. Subject Area: **PCC**

8. Pre-requisite: **Nil**

9. Objective: To impart practical knowledge in Solid Sate Electronic Materials

10. Details of Course:

S. No.	Contents	Contact Hours
1.	Study of variation of resistivity with temperature of metal and highly resistive materials by Four Probe Technique.	14 x 6
2.	Mapping and analysis of the resistivity of large samples (thin films, superconductors) by Four probe Technique.	
3.	To study the temperature dependence of Hall coefficient of n- and p- type semiconductors.	
4.	(a) To measure the dielectric constant and Curie temperature of given ferroelectric samples. (b) To measure the coercive field (E_c), remanent polarization (P_r), Curie temperature (T_c) and spontaneous polarization (P_s) of Barium Titanate ($BaTiO_3$).	
5.	Thermoluminescence in alkali halides crystals. (a) To produce F centers in the crystal exposing to X-ray /UV source. (b) To determine activation energy of the F-centers by initial rise method.	
6.	Verification of Bragg's law and determination of wavelength/energy spectrum of X-rays.	
7.	Study of solar cell characteristics and to determine open circuit voltage 'V_{oc}' , short circuit current 'I_{sc}', Efficiency (η), fill factor, spectral characteristics and chopper characteristics.	
8.	To measure the magnetoresistance of semiconductor and analyze the plots of $\Delta R/R$ and log-log plot of $\Delta R/R$ Vs magnetic field.	
9.	To determine the coercivity, saturation magnetization and retentivity of ferromagnetic samples using magnetic hysteresis loop tracer	

10.	To study the temperature dependence of Laser diode characteristics	
11.	To determine transition temperature of given superconducting material and study Meissner effect.	
12.	To measure critical current density of given superconductor and study its field dependence.	
13	To determine the value of Lande's 'g' factor using ESR spectrometer.	
14	To study C-V characteristics of various solid state devices and materials (like p-n junctions and ferroelectric capacitors).	
	Total	**84**

11. Suggested Books:

S. No.	**Name of Authors/Book/Publisher**	**Year of Publication/Reprint**
1.	Melissinos, A.C. and Napolitano, J., "Experiments in Modern Physics", Academic Press.	2003
2.	Sze, S.M., "Semiconductor Devices Physics and Technology", John Wiley and Sons.	2002
3.	Nakra, B.C. and Chaudhary, K.K., "Instrumentation Measurements and Analysis", Tata McGraw Hill.	2002
4.	Sayer, M. and Mansingh, A., "Measurement, Instrumentation and Experiment Design in Physics and Engineering", Prentice Hall.	2000
5.	Runyan, W.R., "Semiconductor Measurements and Instrumentation", McGraw Hill	2002

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-709** Course Title: **Semiconductor Device Physics**
2. Contact Hours: **L: 3** **T: 1** **P: 0**

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

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

5. Credits: **4** 6. Semester: **Autumn** 7. Subject Area: **PCC**

8. Pre-requisite: **Nil**

9. Objective: To familiarize students with the Advanced Electronics Devices

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Review of P-N Junctions and Bipolar Junction Transistors:** Energy bands, direct and indirect band gap semiconductors, intrinsic and extrinsic material, properties and characteristics of p-n junctions, structure and working principle of Bipolar Junction Transistors.	7
2.	**Junction Field Effect Transistor (JFET):** Structures of n- and p-channel JFET, Pinch-off and saturation, Gate Control, Current Voltage characteristics; Metal-Semiconductor FET (MESFET), GaAs MESFET, High Electron Mobility Transistor (HEMT). **Metal Oxide Semiconductor FETS (MOSFETs):** Structure and working principle of enhancement type and depletion type MOSFETs. Ideal MOS diode, inversion layer, threshold voltage, MOS C-V curve, Effects of work function difference and interface charge on threshold voltage, Output and transfer characteristics of enhancement MOSFET, Control of threshold voltage, SOI Devices, FinFET; Junctionless Transistors.	10
3.	**Tunnel Devices:** Tunnel diode, Band diagram, the tunneling current, the excess current, and the diffusion current, MIS Tunnel Devices, Fowler-Nordheim Tunneling, Direct Tunneling, MIS Switch Diode, MIM Tunnel Diode, Hot-Electron Transistors, Resonant tunneling diode (RTD), Tunnel FET	10
4.	**IMPATT Diodes:** Static characteristics, Breakdown Voltage, Avalanche Region and Drift Region, Dynamic characteristics, Temperature and Space-Charge Effects, Power and	5

	Efficiency, Large-Signal Operation, Power-Frequency Limitation, Limitation on Efficiency, Device Design and Performance, BARITT Diode, Current Transport, Small-Signal Behaviors, TUNNETT Diode.	
5.	**Single Electron Devices:** Single Electron transistors; Single Electron Box, Quantum Resistance, Quantum Conductance, Coulomb Blockade, Stability Diagram, Quantum Coulomb Blockade, Single Electron Turnstile; Single Electron Pumps.	10
	Total	**42**

11. Suggested Books:

S. No.	Name of Authors/Book/Publisher	Year of Publication/Reprint
1.	Sze, S.M. and Kwok, K. Ng, "Semiconductor Devices: Physics and Technology", John Wiley and Sons.	2007
2.	Streetman, B.G., Banerjee, S. K. "Solid State Electronic Devices", Sixth Edition, PHI Learning Private Limited.	2013
3.	Tyagi, M.S., "Semiconductor Materials and Devices", John Wiley and Sons.	2008
4.	Millman J, Halkias C. C., Satyabrata J, "Electronic Devices & Circuits", Tata McGraw Hill	2007
5.	Single Charge Tunneling: Coulomb Blockade Phenomena In Nanostructures by Hermann Grabert, Michel H. Devoret: Springer	1992

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-711** Course Title: **Laboratory Work in Photonics**
2. Contact Hours: **L: 0** **T: 0** **P: 6**
3. Examination Duration (Hrs.): **Theory** **3** **Practical** **0**
4. Relative Weightage: **CWS: 00** **PRS: 50** **MTE: 00** **ETE: 00** **PRE: 50**

5. Credits: **4** 6. Semester: **Autumn** 7. Subject Area: **PCC**

8. Pre-requisite: **Nil**

9. Objective: To impart practical knowledge of photonic components and devices.

10. Details of Course:

	Contents	Contact Hours
	List of experiments 1. Characterization of single-mode fiber: mode-field diameter, bend loss and cut-off wavelength. 2. Characterization of multi-mode fiber: numerical aperture and refractive index profile. 3. Characterization of planar optical waveguides: refractive index profiling by prism coupling method. 4. Study of acousto-optic modulation. 5. Study of electro-optic modulation. 6. Characterization of light emitting diode. 7. Characterization of Laser Diode. 8. Characterization of photo-voltaic solar cell. 9. Characterization of photodetectors. 10. To study characteristics of an opto-coupler. 11. Deposition of thin films by thermal evaporator and spin coating and optical characterization by spectro-photometer. 12. Study of optical time domain reflectometry.	84
	Total	**84**

11. Suggested Books:

S.No.	Name of Authors/ Books/Publishers	Year of Publication/ Reprint
1.	Shenoy M R, Khijwania S K, Ghatak A K and Pal B P, "Fiber Optics Through Experiments," Viva Books	2009
2.	Ghatak A. and Thyagarajan K., "Optical Electronics," Cambridge University Press	2003
3.	Agrawal G. P., "Optical Fiber Communication System," Wiley Interscience	2010

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF THE DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject code: **PHN-715** Course Title: **Analog Integrated Circuit Design**
2. Contact Hours: **L: 3** **T: 1** **P: 0**
3. Examination Duration (Hours): **Theory 3** **Practical 0**
4. Relative Weightage: **CWS: 25** **PRS: 00** **MTE: 25** **ETE: 50** **PRE: 00**
5. Credit: **4** 6. Semester: **Autumn** 7. Subject Area: **PEC**

8. Pre-requisite: Knowledge of Basics Electronics

9. Objective: To familiarize students with the basics of Analog Integrated Circuits

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Feedback Systems and Stability:** Discreet time signals, System State Response, loop gain, delay in loop, Negative Feedback Amplifiers, Phase Margin. Review of Semiconductor Devices.	8
2.	**Block Label Design:** Operational Amplifiers realization using controlled sources, Single stage opamp realization and its characteristics, Two stage and three stage miller compensated opamp, Feedforward Compensated opamp, typical opamp data sheet, opamp offset, transimpedence amplifiers.	6
3.	**Components on IC:** Components available in a CMOS process, MOS transistors basics, Parasitics, speed and mismatch, Noise in resistors, Noise in MOS transistors, Noise Scaling	6
4.	**Opamp and amplification stages:** Basic amplifiers stages, common drain; Frequency response of amplifiers, Common source amplifiers frequency response, common mode rejection ratio and examples, Differential Amplifiers,	6
5.	**Opamp design:** Differential and common mode half circuits, Differential pair with active load, Fully Differential single stage and two stage opamp Circuits, Fully Differential single stage opamp, common mode feedback, circuit simulator and analysis	8
6.	**Phased Locked Loop:** Frequency Multiplier, Phase domain Model, Type I, II PLL transfer function, noise and implementation, Oscillator phase noise, LC and ring Oscillators	4
7.	**Miscellaneous Components:** Voltage and current generators, low dropout regulators, continuous time filters, Switched Capacitor filters.	4
	Total	**42**

11. Suggested Books:

S.No.	Name of Authors/ Publishers	Year of Publication/Reprint
1.	T.C. Carusone, Davis Johns, Ken Martin, "Analog integrated circuit design ," J wiley & sons, Inc.	2012
2.	Gopal, M., "Control Systems: Principles and Design," Tata McGraw-Hill Education.	2002
3	Behzad Razavi, "Design of analog CMOS integrated circuits," MacGraw-Hills.	2000
4	Sergio Franco, "Design with operational amiplifiers and analog ICs," Tata McGraw-Hill.	2002
5	Paul R Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," Wiley.	2009

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF THE DEPTT./CENTRE: **DEPARTMENT OF PHYSICS**

6. Subject code: **PHN-717** Course Title: **Digital Signal Processing**

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

8. Examination Duration (Hours): **Theory 3** **Practical 0**

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

10. Credit: **4** 6. Semester: **Autumn** 7. Subject Area: **PEC**

8. Pre-requisite: **None**

9. Objective: To familiarize students with the basics of Digital Signal Processing

10. Details of Course:

S. No.	Contents	Contact Hours
1	**Sampling and Reconstruction of continuous time signals**: Periodic sampling, Frequency domain representation of sampling, Reconstruction of a band limited signal from its samples, Changing the sampling rate using discrete time processing, Decimation and Interpolation.	4
2	**Characterization and properties of discrete time signals and systems:** Discrete-Time sequences and systems, Properties of linear time-invariant systems, Linear convolution, Eigen functions for linear time-invariant systems, Linear constant-coefficient difference equations.	6
3	**Computation of DTFT and DFT and its properties** Representation of sequences by discrete time Fourier transforms (DTFT), Symmetry properties of the Fourier transform, Fourier transform theorems. The Fourier transform of periodic signals, Sampling the Fourier transform, The discrete Fourier transform (DFT) and its properties, Circular and linear convolution using the discrete Fourier transform.	8
4	**Fast Fourier Transform (FFT) algorithms, The Z-transform and its properties:** Efficient computation of DFT, Goertzel algorithm, Decimation in-Time FFT algorithm, Decimation-in-Frequency FFT algorithm, Z-Transform, Region of convergence of the ZT, and its properties.	4
5	**Transform analysis of linear time invariant (LTI) systems, Implementation of structures for discrete time systems:** The frequency response of LTI systems, Frequency response for rational system functions, All pass and minimum-phase systems. Block diagram and signal flow graph representation of linear constant-coefficient difference equations, Basic structures for infinite impulse response (IIR) and finite impulse response (FIR) systems, Transposed forms	8

6	**Digital filter design techniques:** Design of Discrete-time IIR Filters from Continuous-time Filters, Design of FIR filters by windowing, Brief overview of optimum and equi-ripple approximation of FIR filters,	4
7	**Overview of Digital Image Processing:** Introduction to digital image processing (DIP), concept of dimension, concept of bits per pixel, pixel resolution, image transformation, convolution and reconstruction, low and high pass filters, optical character recognition and its applications.	8
	Total	**42**

11. Suggested Books:

S. No.	Name of Authors/Book/Publisher	Year of Publication/Reprint
1.	Sze, S.M. and Kwok, K. Ng, "Semiconductor Devices: Physics and Technology", John Wiley and Sons.	2007
2.	Streetman, B.G., Banerjee, S. K. "Solid State Electronic Devices", Sixth Edition, PHI Learning Private Limited.	2013
3.	Tyagi, M.S., "Semiconductor Materials and Devices", John Wiley and Sons.	2008
4.	Millman J, Halkias C. C., Satyabrata J, "Electronic Devices & Circuits", Tata McGraw Hill	2007
5.	Single Charge Tunneling: Coulomb Blockade Phenomena In Nanostructures by Hermann Grabert, Michel H. Devoret: Springer	1992

Item No.69.28: To report the Seat Matrix for JEE/JAM-2017 and inform the provisions to be made regarding implementation of Section (32)(1) of the Rights of Persons with Disabilities Act, 2016 from next academic year.

The Seat Matrix for JEE/JAM 2017-18 was requested by the respective examination units and was approved by the Chairman Senate with 3% provision for Persons with disability. This is given at **Appendices 'A'** and **'B'.**

As per the intimation received from MHRD, GOI, (letter F.No.32-9/2017-TS-1 dated 04.5.2017) the admission provision for Persons with Disability has been increased from 3% to 5% and has to be implemented from next admission examination. (**Appendix-C**)

The above is reported to the Senate.

REVISION OF B.TECH /B.ARCH/IDD/INT M.TECH/INT.MSc SEATS FOR THE YEAR 2017 (3%)

Year	2017	Distribution				PD 2017					International student (10% intake)
Department	Intake	GEN	OBC	SC	ST	G	O	C	T	TOTAL	
BIOTECH	35	17	10	5	3	1	0	0	0	1	4
CHEMICAL	90	45	24	14	7	1	1	1	0	3	9
CIVIL	135	69	36	20	10	1	2	0	1	4	14
CSE	75	38	20	11	6	1	1	0	0	2	8
ELECTRICAL	120	61	32	18	9	1	1	1	1	4	12
E&CE	80	40	22	12	6	1	0	1	0	2	8
ENG. PHYSICS	30	15	8	5	2	1	0	0	0	1	3
MECHANICAL	100	50	27	15	8	1	1	0	0	2	10
MMED	80	40	22	12	6	2	1	0	0	3	8
PS	30	15	8	5	2	0	0	1	0	1	3
P & I	40	20	11	6	3	1	0	0	0	1	4
ARCH.	30	15	8	5	2	1	0	0	0	1	3
IMT-GT	30	15	8	5	2	0	0	1	0	1	3
IMT-GPT	30	15	8	5	2	1	0	0	0	1	3
IMS-APM	30	15	8	5	2	1	0	0	0	1	3
IMS-PHY	20	10	5	3	2	0	1	0	0	1	2
IMS-CHY	20	10	5	3	2	1	0	0	0	1	2
TOTAL	975	490	262	149	74	15	8	5	2	30	99

Appendix 'A'
Item No. Senate/69.28

Appendix-C

3% Seat Matrix _IITR_JAM 2017

Seat Matrix 2017-18 (PD Seat Distribution @3%)

ZONE	ZONE NAME	M.Sc.	PROG	PAPER CODE	GEN	OBC	SC	ST	TOTAL SEAT	GEN-PD	OBC-PD	SC-PD	ST-PD
18	IIT ROORKEE	APPLIED GEOLOGY	1801	GG	8	4	2	1	15	0	0	0	0
18	IIT ROORKEE	BIOTECHNOLOGY	1802	BT	18	10	6	3	37	1	0	0	0
18	IIT ROORKEE	CHEMISTRY	1803	CY	23	12	7	3	45	1	1	1	0
18	IIT ROORKEE	MATHEMATICS	1804	MA	15	8	5	2	30	1	0	0	0
18	IIT ROORKEE	PHYSICS	1805	PH	12	7	4	2	25	0	0	0	0
18	IIT ROORKEE	ECONOMICS	1806	MA	11	6	4	1	22	0	0	0	0
18	IIT ROORKEE	ECONOMICS	1806	MS	4	2	1	1	8	0	0	0	0
					91	**49**	**29**	**13**	**182**	**3**	**1**	**1**	**0**

As discussed with the GATE 2017, distribution of PD Seats @ 5% is worked out as revised.

27/7/17

Appendix 'C'
Item No. Senate/69.28

F. No. 32-9/2017-TS-I
Government of India
Ministry of Human Resource Development
Department of Higher Education
Technical Section-I
******

Shastri Bhawan, New Delhi
Dated the 4th May, 2017

To,

The Directors,
All IITs

Subject:- Implementation of Section(32)(1) of the Rights of Persons with Disabilities Act, 2016- reg.

Sir,

I am directed to refer to this Ministry's letter (copy enclosed) of even number dated 24th April, 217 on the above mentioned subject and to say that the matter of applicability of the Section 32(1) of the Rights of Persons with Disabilities Act, 2016 for admission to IITs against JEE(Mains) and JEE(Advanced) was taken up with the Department of Legal Affairs, Ministry of Law and Justice, and as per their advice, since the process of examination for the academic session 2017-18 has already begun, the said provision shall be applicable only from the next examination.

Yours faithfully,

Encl.: as above

(Kundan Nath)
Under Secretary to the Government of India
Ph No. 011-23381698

Copy to:

i. Sh. K. V. S. Rao, Director, D/o Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment.
ii. Ms. Arti Chopra, Assistant Legal Adviser, Department of Legal Affairs, Ministry of Law and Justice.

Item No. 69.29: To report the minor modifications in B.Tech. (Engineering Physics) and M.Sc. (Physics) course structures as proposed by the Department of Physics.

On the recommendation of the 55th IAPC, the Chairman Senate has approved the minor modifications in B.Tech. (Engineering Physics) and M.Sc. (Physics) course structures and the following syllabi as given in **Appendix 'A':**

1. PHN-102: Analog Electronics
2. PHN-207: Thermal and Statistical Physics
3. PHN-209: Digital Electronics and Circuits
4. PHN-211: Quantum Physics
5. PHN-505: Advanced Mathematical Physics

The above is reported to the Senate.

Appendix-A

PROGRAM CODE : 122 - B.Tech. Engineering Physics
DEPARTMENT : Department of Physics
YEAR : I

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MAN-001	Mathematics – 1	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-101	Introduction to Engineering Physics	PCC	2	2	0	0	0	0	0	0	0	100	0
3.	PHN-103	Computer Programming	ESC	4	3	0	2	3	0	15	25	20	40	0
4.	CYN-001	Physical Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	0
5.	HSN-002	Ethics and Self Awareness	HSSC	2	1	1	0	2	0	25	0	25	50	0
6.	CEN-105	Introduction to Environmental Studies	GSC	3	3	0	0	3	0	25	0	25	50	0
7.	HSN-001A/B	Communication Skills (Basic / Advanced)	HSSC	2	1	0	2	2	0	25	0	25	50	0
		TOTAL		**21**										
(Spring)														
1.	MAN-010	Optimization Techniques	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-008	Electromagnetic Theory	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-102	Analog Electronics	PCC	4	3	1	2/2	3	0	20	20	20	40	0
4.	PHN-104	Mechanics and Relativity	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	EEN-112	Electrical Science	ESC	4	3	1	0	3	0	25	0	25	50	0
6.	CYN-002	Organic and Inorganic Chemistry	BSC	4	3	1	0	3	0	25	0	25	50	0
		TOTAL		**24**										

93

Item No. Senate/69.29
Appendix 'A'

PROGRAM CODE : 122 - B.Tech. Engineering Physics
DEPARTMENT : Department of Physics
YEAR : II

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MIN-003	Mechanical Engineering Drawing	ESC	4	2	0	4	0	4	0	50	0	0	50
2.	PHN-205	Engineering Analysis and Design	PCC	3	2	0	2	3	0	25	0	25	50	0
3.	PHN-207	Thermal and Statistical Physics	PCC	4	3	0	2	3	0	15	25	20	40	0
4.	PHN-209	Digital Electronics and Circuits	PCC	4	3	1	2/2	3	0	20	20	20	40	0
5.	PHN-211	Quantum Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
6.	HSN-ELE	HSS Elective Course[1]	HSSMC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**21**										
(Spring)														
1.	MTN-105	Electrical and Electronics Materials	ESC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-204	Atomic Molecular and Laser Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	PHN-206	Elements of Condensed Matter Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	PHN-208	Nuclear Physics and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
5.	PHN-210	Mathematical Physics	PCC	3	3	1	0	3	0	25	0	25	50	0
6.	PHN-214	Applied Optics	PCC	4	3	0	2	3	2	15	25	20	40	0
		TOTAL		**20**										

PROGRAM CODE : 122 - B.Tech. Engineering Physics
DEPARTMENT : Department of Physics
YEAR : III

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			(Autumn)											
1.	PHN-311	Numerical Analysis and Computational Physics	PCC	3	2	0	2	3	2	15	25	20	40	0
2.	PHN-313	Signals and Systems	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-315	Laser & Photonics	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	PHN-317	Plasma Physics and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
5.	PHN-319	Technical Communication	PCC	2	2	0	0	3	0					
6.	PHN-ELE-1	Depratmental Elective I	PEC	4										
7.	OEC/ BM-ELE	Open Elective Course/Management Studies Elective Course[2]	OEC/HSSMEC	3	2	1	0	2	0	25	0	25	50	0
		TOTAL		**19/22**										
			(Spring)											
1.	PHN-310	Applied Instrumentation	PCC	3	3	0	2/2	3	2	20	20	20	40	0
2.	PHN-312	Semiconductor Devices	PCC	3	3	0	2/2	3	2	20	20	20	40	0
3.	PHN-314	Microprocessors and Peripheral Devices	PCC	4	3	0	2	3	2	15	25	20	40	0
4.	PHN-ELE2	Depratmental Elective II	PEC	4										
5.	PHN-300	Industry-oriented Problem / Lab-based Project / Software Engineering-based Project	PCC	4	0	0	6	-	100					
6.	OEC/BM-ELE	Open Elective Course/Management Studies Elective Course[2]	OEC/HSSMEC	3	3	2	1	0	2	0	25	0	25	50
7.	PHN-399	Educational Tour	PCC	0	0	0	0	0	0	0	0	0	0	0
8.	MSC1/ DHC1	MSC** - 1/ DHC*** - 1 (optional)	MSC/ DHC	4										
		TOTAL		**21/25**										

PROGRAM CODE : 122 - B.Tech. Engineering Physics
DEPARTMENT : Department of Physics
YEAR : IV

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)	Relative Weights (%					
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	PHN-ELE3	Depratmental Elective III	PEC	4										
2.	PHN-ELE4	Depratmental Elective IV	PEC	4										
3.	PHN-499	Training Seminar	PCC	2	0	2	0	-	0	100	0	0	0	0
4.	PHN-400A	B.Tech. Project	PCC	4										100
5.	MSC2/DHC2	MSC - 2 / DHC - 2 (optional)	MSC/DHC	4										
6.	MSC3/DHC3	MSC - 3 / DHC - 3 (optional)	MSC/DHC	4										
		TOTAL		**14/22**										
(Spring)														
1.	PHN-ELE5	Depratmental Elective V	PEC	4										
2.	PHN-ELE6	Depratmental Elective VI	PEC	4										
3.	PHN-400B	B.Tech Project (Contd. from Autumn Semester)	PCC	8										100
4.	MSC4/DHC4	MSC - 4 / DHC - 4 (optional)	MSC/DHC	4										
5.	MSC5/DHC5	MSC - 5 / DHC - 5 (optional)	MSC/DHC	4										
		TOTAL		**16/24**										

[1] – Any one course in this category is to be opted either in the Autumn or in the Spring semester in the II year. The course should be selected from the list (basket) of Humanities and Social Sciences Elective Courses.

[2] – One course each from the OEC and the HSSMEC categories is to be opted either in the Autumn or in the Spring semester in the III year. The HSSMEC course should be selected from the list (basket) of Management Studies Elective Courses.

*DEC - Departmental Elective Course

**MSC - Minor Specialization Course

***DHC - Departmental Honours Course

PROGRAM CORE COURSES (PCC)

DCC Year I Spring

1. Electromagnetic Theory (PHN-008 : 3-1-0)
2. Analog and Digital Electronics (PHN-102, 3-0-2)
3. Thermal and Statistical Physics (PHN-104, 3-0-2)

DCC Year II Autumn

4. Engineering Analysis and Design (PHN-205, 2-0-2)
5. Mechanics and Relativity (PHN-207, 3-1-0)
6. Mathematical Physics (PHN-209, 3-0-0)
7. Quantum Physics (PHN-211, 3-0-0)

DCC Year II Spring

8. Atomic , Molecular and Laser Physics (PHN-204, 3-0-0)
9. Elements of Condensed Matter Physics (PHN-206, 3-0-0)
10. Nuclear Physics and Applications (PHN-208, 3-0-0)
11. Microprocessors and Peripheral Devices (PHN-210, 3-1-2)
12. Applied Optics (PHN-214, 3-0-2)

DCC Year III Autumn

13. Numerical Analysis and Computational Physics (PHN-311, 2-0-2)
14. Signals and Systems (PHN-313, 3-1-0)
15. Laser & Photonics (PHN-315, 3-0-0)
16. Plasma Physics and Applications (PHN-317, 3-0-0)
17. Technical Communication (PHN-319, 2-0-0)

DCC Year III Spring

18. Applied Instrumentation (PHN-310, 3-1-2/2)
19. Semiconductor Devices (PHN-312: 3-1-2/2)

PROGRAM ELECTIVE COURSES (PEC)

DEC Year III Autumn (Any One)

1. Digital Image Processing (EE-352 : 3-1-0)
2. Fabrication and Measurement Techniques(PHN-321, 2-0-4)
3. Radiation Detection and Measurements(PHN-323, 3-1-0)
4. Atmospheric Physics and Climate Dynamics (PHN-325, 3-1-0)
5. Physics of Nanosystems(PHN-327, 3-1-0)
6. Superfluidity and Superconductivity(PHN-329, 3-1-0)
7. Nuclear Astrophysics(PHN-331, 3-1-0)

DEC Year III Spring (Any One)

8. Principles of Digital Communication (EC-212 : 3-1-0)
9. Properties of Matter and Acoustics (PHN-316, 3-0-2)
10. Data Structures (MA-106 : 3-0-2)
11. Atomic and Molecular Collision Physics(PHN-318, 3-1-0)
12. Fiber and Nonlinear Optics(PHN-320, 3-1-0)
13. Modern Particle Physics(PHN-322, 3-1-0)
14. Nanotechnology(PHN-324, 3-1-0)

DEC Year IV Autumn (Any Two)

15. Principles of Remote Sensing (ES-401: 2-1-0)
16. Superconducting Materials(PHN-425, 3-1-0)
17. Digital Signal Processing (EE-355, 3-1-2/2)
18. Quantum Information & Computing (PHN-427, 3-1-0)
19. Nuclear Science & Engineering(PHN-429, 3-1-0)
20. Weather Forecasting(PHN-431, 3-1-0)
21. Introduction to Superstring theory(PHN-433, 3-1-0)
22. Advanced Characterization Techniques(PHN-435, 3-1-0)
23. A Primer in Quantum Field Theory(PHN-437, 3-1-0)
24. Optical Communication Systems (PHN-439, 3-0-3)

DEC Year IV Spring (Any Two)

25. Biophysics and Applications (BT-xx, 3-1-0)
26. Emerging Phenomenon in Materials(PHN-422, 3-1-0)
27. Optoelectronics (PHN-424, 3-1-0)
28. Space Technology(PHN-426, 3-1-0)
29. Advanced Electroceramics Technology (PHN-428, 3-1-0)
30. Solar Terrestrial Physics(PHN-430, 3-1-0)
31. Computational Nuclear Physics(PHN-432, 3-1-0)
32. Organic Electronics (PHN-434, 3-0-3)

List of Minor Specialization courses of Physics for other Departments

					Teaching Scheme (Hrs./Week)			
	Subject Code	Course Title	Semester in which the course is running	Subject area	Credits	L	T	P
1	PHN-207	Mechanics and Relativity	Autumn	DCC/MSC	4	3	1	0
2	PHN-211	Quantum Physics	Autumn	DCC/MSC	4	3	1	0
3	PHN-204	Atomic Molecular and Laser Physics	Spring	DCC/MSC	3	3	0	0
4	PHN-206	Elements of Condensed Matter Physics	Spring	DCC/MSC	3	3	0	0
5	PHN-208	Nuclear Physics and Applications	Spring	DCC/MSC	3	3	0	0
				Total	17	15	2	0

Department Honor Courses DHC (B. Tech - Engineering Physics)

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Elective-Group-I (VI Semester: One paper to be chosen)														
1.	PHN-601	Advanced Condensed Matter Physics	DHC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-603	Advanced Atmospheric Physics	DHC	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-605	Advanced Laser Physics	DHC	4	3	1	0	3	0	25	0	25	50	0
4.	PHN-607	Advanced Nuclear Physics	DHC	4	3	1	0	3	0	25	0	25	50	0
5.	PHN-639	Advanced Atomic and Molecular Physics	DHC	4	3	1	0	3	0	25	0	25	50	0
Elective- Group-II(VII Semester: One paper to be chosen)														
6.	PHN-609	Experiments in Condensed Matter Physics	DHC	3	0	0	6	3	0	0	50	0	0	50
7.	PHN-611	Experiments in Atmospheric Physics	DHC	3	0	0	6	3	0	0	50	0	0	50
8.	PHN-613	Experiments in Laser Physics	DHC	3	0	0	6	3	0	0	50	0	0	50
9.	PHN-615	Experiments in Nuclear Physics	DHC	3	0	0	6	3	0	0	50	0	0	50
Elective- Group-III (VII Semester: One paper to be chosen)														
10.	PHN-617	Advanced Characterization Techniques	DHC	3	3	0	0	3	0	25	0	25	50	0
11.	PHN-619	A Primer in Quantum Field Theory	DHC	3	3	0	0	3	0	25	0	25	50	0
12.	PHN-621	Astrophysics	DHC	3	3	0	0	3	0	25	0	25	50	0
13.	PHN-623	General Relativity	DHC	3	3	0	0	3	0	25	0	25	50	0
14.	PHN-625	Particle Physics	DHC	3	3	0	0	3	0	25	0	25	50	0
15.	PHN-627	Quantum Theory of Solids	DHC	3	3	0	0	3	0	25	0	25	50	0
16.	PHN-629	Weather Forecasting	DHC	3	3	0	0	3	0	25	0	25	50	0
17.	PHN-631	Nuclear Instrumentation	DHC	3	3	0	0	3	0	25	0	25	50	0
18.	PHN-633	Physics and Technology of Thin Films	DHC	3	3	0	0	3	0	25	0	25	50	0
19.	PHN-635	Advanced Nuclear reactions	DHC	3	3	0	0	3	0	25	0	25	50	0
20.	PHN-637	Semiconductor Photonics	DHC	3	3	0	0	3	0	25	0	25	50	0
Elective- Group-IV (VIII Semester: Two papers to be chosen)														
21.	PHN-602	Nuclear Astrophysics	DHC	3	3	0	0	3	0	25	0	25	50	0

22.	PHN-604	Physics of Nanosystems	DHC	3	3	0	0	3	0	25	0	25	50	0
23.	PHN-606	Superfluidity and Superconductivity	DHC	3	3	0	0	3	0	25	0	25	50	0
24.	PHN-608	Fiber and Nonlinear Optics	DHC	3	3	0	0	3	0	25	0	25	50	0
25.	PHN-610	Quantum Optics	DHC	3	3	0	0	3	0	25	0	25	50	0
26.	PHN-612	Advanced topics in Mathematical Physics	DHC	3	3	0	0	3	0	25	0	25	50	0
27.	PHN-614	Introduction to Superstring theory	DHC	3	3	0	0	3	0	25	0	25	50	0
28.	PHN-616	Advanced Electroceramics Technology	DHC	3	3	0	0	3	0	25	0	25	50	0
29.	PHN-618	Atomic and Molecular Collision Physics	DHC	3	3	0	0	3	0	25	0	25	50	0
30.	PHN-620	Advanced Quantum Field Theory	DHC	3	3	0	0	3	0	25	0	25	50	0
31.	PHN-622	Solar Terrestrial Physics	DHC	3	3	0	0	3	0	25	0	25	50	0
32.	PHN-624	Computational Nuclear Physics	DHC	3	3	0	0	3	0	25	0	25	50	0

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code: **XX** **M.Sc. (Physics)**
Department: **PH** **Physics**
Year: **I**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Semester- I (Autumn)														
1.	HS-501	Technical Communication	PCC	2	1	0	2	2	0	15	25	20	40	0
2.	PHN-503	Quantum Mechanics – I	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-505	Advanced Mathematical Physics	PCC	4	3	1	0	3	0	25	0	25	50	0
4.	PHN-507	Classical Electrodynamics	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	PHN-509	Classical Mechanics	PCC	3	3	0	0	3	0	25	0	25	50	0
6.	PHN-513	Semiconductor Devices and Applications	PCC	4	3	0	3	3	3	20	20	20	40	0
		Total		21										
Semester-II (Spring)														
1.	PHN-502	Laboratory Work	PCC	3	0	0	6	0	4	0	50	0	0	50
2.	PHN-504	Condensed Matter Physics	PCC	3	3	0	0	3	0	25	-	25	50	-
3.	PHN-506	Statistical Mechanics	PCC	3	3	0	0	3	0	25	-	25	50	-
4.	PHN-508	Quantum Mechanics - II	PCC	3	3	0	0	3	0	25	-	25	50	-
5.	PHN-512	Physics of Earth's Atmosphere	PCC	4	3	1	0	3	0	25	-	25	50	-
6.	PHN-516	Atomic, Molecular and Laser Physics	PCC	4	3	1	0	3	0	25	-	25	50	-
7.	PHN-518	Elements of Nuclear and Particle Physics	PCC	4	3	1	0	3	0	25	0	25	50	0
		Total		24										

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code: **XX** **M.Sc. (Physics)**
Department: **PH** **Physics**
Year: **II**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Semester- I (Autumn)														
1	PHN-601	Numerical Analysis & Computer Programming	PCC	4	3	0	2	2	2	15	25	20	40	-
2.	PHN-699	Seminar	SEM	2	0	0	0	0	0	-	-	-	100	-
3.	PHN-600A	Dissertation Stage I	DIS	3	0	0	0	0	0	-	-	-	100	0
4.		Departmental Elective -I	PEC	4	3	0	3	3	3	20	20	20	40	-
5.		Departmental Elective -II	PEC	4	3	1	0	3	0	25	-	25	50	-
6.		Departmental Elective -III	PEC	4	3	1	0	3	0	25	-	25	50	-
7		Departmental Elective -IV	PEC	4	3	1	0	3	0	25	-	25	50	-
8.														
		Total		25										
Semester-II (Spring)														
1.		Departmental Elective –V	PEC	4	3	1	0	3	0	25	-	25	50	-
2.		Departmental Elective -VI	PEC	4	3	1	0	3	0	25	-	25	50	-
3.	PHN-600B	Dissertation Stage II	DIS	9	0	0	0	0	0	0	0	0	100	0
		Total		17										

Program Elective Courses (M.Sc. Physics)

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Departmental Elective -I (III Semester: One paper to be chosen)														
1.	PHN-601	Advanced Condensed Matter Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
2.	PHN-603	Advanced Atmospheric Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
3.	PHN-605	Advanced Laser Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
4.	PHN-607	Advanced Nuclear Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
Departmental Electives (III Semester: Three paper to be chosen & IV Semester: Two paper to be chosen)														
5.	PHN-602	Nuclear Astrophysics	PEC	4	3	1	0	3	0	25	-	25	50	-
6.	PHN-604	Physics of Nanosystems	PEC	4	3	1	0	3	0	25	-	25	50	-
7.	PHN-606	Superfluidity and Superconductivity	PEC	4	3	1	0	3	0	25	-	25	50	-
8.	PHN-608	Fiber and Nonlinear Optics	PEC	4	3	1	0	3	0	25	-	25	50	-
9.	PHN-610	Quantum Optics	PEC	4	3	1	0	3	0	25	-	25	50	-
10.	PHN-612	Advanced topics in Mathematical Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
11.	PHN-614	Introduction to Superstring theory	PEC	4	3	1	0	3	0	25	-	25	50	-
12.	PHN-616	Advanced Electroceramics Technology	PEC	4	3	1	0	3	0	25	-	25	50	-
13.	PHN-617	Advanced Characterization Techniques	PEC	4	3	1	0	3	0	25	-	25	50	-
14.	PHN-618	Atomic and Molecular Collision Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
15.	PHN-619	A Primer in Quantum Field Theory	PEC	4	3	1	0	3	0	25	-	25	50	-
16.	PHN-620	Advanced Quantum Field Theory	PEC	4	3	1	0	3	0	25	-	25	50	-
17.	PHN-621	Astrophysics	PEC	4	3	1	0	3	0	25	-	25	50	-
18.	PHN-622	Solar Terrestrial Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
19.	PHN-623	General Relativity	PEC	4	3	1	0	3	0	25	-	25	50	-
20.	PHN-624	Computational Nuclear Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
21.	PHN-625	Particle Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
22.	PHN-626	Advanced Atomic and Molecular Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
23.	PHN-627	Quantum Theory of Solids	PEC	4	3	1	0	3	0	25	-	25	50	-
24.	PHN-629	Weather Forecasting	PEC	4	3	1	0	3	0	25	-	25	50	-
25.	PHN-631	Nuclear Instrumentation	PEC	4	3	1	0	3	0	25	-	25	50	-
26.	PHN-633	Physics and Technology of Thin Films	PEC	4	3	1	0	3	0	25	-	25	50	-
27.	PHN-635	Advanced Nuclear reactions	PEC	4	3	1	0	3	0	25	-	25	50	-
28.	PHN-637	Semiconductor Photonics	PEC	4	3	1	0	3	0	25	-	25	50	-
29.	PHN-638	Advanced Light Sources	PEC	4	3	1	0	3	0	25	-	25	50	-
30.	PNN-639	Superconducting Radio Frequency for particle accelerators	PEC	4	3	1	0	3	0	25	-	25	50	-

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN- 102** Course Title: **Analog Electronics**

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

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

4. Relative Weight: **CWS: 20** **PRS: 20** **MTE: 20** **ETE: 40** **PRE: 00**

5. Credits: **4** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **None**

9. Objective:To introduceconcepts and applications of analog electronics

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Semiconductor Diodes and Basic Diode Circuits:** Basic properties of Si, Ge and GaAs from diode perspective, Intrinsic and extrinsic semiconductors, Formation of *p-n* junction, Qualitative theory of the p-n junction, Current flow mechanism in forward and reverse biased diode, Volt-Ampere characteristics, Static and dynamic resistance of diode, Junction capacitance, Diode equivalent circuits, Load line analysis, p-n junction as a rectifier, Rectifier circuits (Half wave, Full wave, Bridge), Clippers and Clampers, Zener diode, Zener regulator, Loaded Zener regulator.	6
2.	**Bipolar Junction transistors:** *n-p-n* and *p-n-p* transistors, Characteristics of CB, CE and CC configurations,Current gains α, β and γ, and relations between them; Active, cutoff and saturation regions, Biasing of transistors: base bias, emitter bias, voltage divider bias, emitter follower circuit, Load line analysis	8
3.	**Field Effect Transistors**: Junction field effect transistors, Pinch-off voltage, Volt-Ampere characteristics of JFET, Insulated-gate field-effect transistor(MOSFET), Enhancement MOSFET, Depletion MOSFET, n-MOS, p-MOS, CMOS, FET biasing as covered in BJTs	6
4.	**Amplifiers:** Small signal analysis of a transistor, h parameters, h parameter equivalent circuits; BJT amplifiers: CE, CB, CC amplifiers and their analysis and comparison; FET amplifiers: Small signal model, Different configurations (Self-bias, voltage divider, Common Gate, Common Drain); Frequency effects in amplifiers, Differential	8

	amplifiers: A.C. and D.C. analysis, Common mode gain, and CMRR;	
5	**Operational amplifiers:** Inverting and non-inverting amplifiers, feedback in amplifiers: effects of positive and negative feedback on input impedance, output impedance, gain, stability, distortion and noise, Op-amp applications: Addition, subtraction, differentiation and integration.	8
6.	**Oscillators:** Sinusoidal oscillators:Barkhausen's criterion for self-sustained oscillations, The Wien-Bridge oscillators, RC phase shift oscillators, RC Twin-T oscillators, LC Oscillators: Armstrong, Hartley, Clapp and Crystal Oscillators, Non-sinusoidal oscillators–multivibrators;	6
	Total	**42**

11. Suggested Books:

S. No.	Name of Authors /Books / Publishers	Year of Publication/ Reprint
1.	Streetman B G and Banerjee S, "Solid State Electronic Devices", 6th Ed.Prentice Hall	2006
2.	Boylestad R L and Nashelsky L, "Electronic Devices and Circuit Theory", 8th Ed.Pearson Education	2004
3.	Malvino A P, "Electronic Principles", 7th Ed. McGraw Hill	2006
4.	Malvino A P and Leach D P, "Digital Principles and Applications", McGraw Hill	1998
5.	Dedra A S and Smith K C, " Microelectronic Circuits: Theory and Applications", 6th Ed. Oxford University Press	2013
6.	Millman J and Halkias C C, "Integrated Electronics", Tata McGraw Hill	1995

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE: **DEPARTMENT OF PHYSICS**

1.Subject Code: **PHN-207** Course Title: **Thermal and Statistical Physics**

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

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

4. Relative Weight: **CWS: 15** **PRS: 25** **MTE: 20** **ETE: 40** **PRE: 00**

5. Credits: **4** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **None**

9. Objective: The course aims at familiarizing students with laws of thermodynamics and their correspondence with statistical mechanics

10. Details of Course:

S.No.	Contents	Contact Hours
1.	Concept of pressure and radiation thermometry and absolute temperature, internal energy function, heat capacity, hydrostatic system, extensive and intensive parameters, conduction, convection, radiation of heat, Kirchhoff's law of radiated heat and Stefan-Boltzmann law	5
2.	Equation of state of ideal and real gas, quasi-static, adiabatic process, microscopic point of view, irreversible part of the second law, heat and entropy in irreversible and reversible processes, entropy and non-equilibrium states, application of the entropy principle	5
3.	Phase diagram of pure substance: PV, PT, TS diagram, volume expansivity, compressibility, molar heat capacities and its measurement, drawback of equipartition theorem	5
4.	Enthalpy, Helmholtz and Gibb's functions, Maxwell's thermodynamic relations, heat capacity equation, chemical potential, criteria for first- and second-order phase transitions and their study of in terms of thermodynamic potentials/free energies	5
5.	Free expansion of a gas, throttling process and inversion curve, liquefaction of gases, magnetic cooling, phase behavior of helium	5
6.	Phase space and definition of microstates, Liouville's theorem and its consequences, a priori equal probability, microcanonical ensemble, contact between statistics and thermodynamics	7

7.	Isolated system and its contact with a heat reservoir, canonical ensemble, calculation of thermodynamic quantities for an ideal monatomic gas and Gibbs paradox	**5**
8.	Identical particles and symmetry requirements, M-B, B-E and F-D statistics and the corresponding distribution functions, blackbody spectrum	**5**
	Total	**42**

List of experiments:

I	Measurement of temperature using thermister
II	Specific heat measurements
III	Stefan's constant and work function of a photo cathode using incandescent lamp
IV	Thermal conductivity of metal by Searle's apparatus.
V	Verification of Stefan's law
VI	J by Callendar and Barn's method
VII	Temperature coefficient of resistance by Callendar and Griffiths bridge
VIII	Thermal conductivity of glass (tube form)
IX	Co-efficient of thermal expansion
X	Thermo-emf by potentiometer
XI	Thermal equation of state and critical point

11. Suggested Books:

S. No.	**Name of Authors /Books / Publishers**	**Year of Publication/ Reprint**
1.	Reif F, "Fundamentals of Statistical and Thermal Physics", McGraw Hill	1965
2.	Zemansky M W and Dittman R H, "Heat and Thermodynamics", McGraw Hill	1997
3.	Sears F W and Salinger G L, "Thermodynamics, Kinetic Theory and Statistical Thermodynamics", Narosa Publishers	1998
4.	Huang K, "Statistical Mechanics", John Wiley	1987
5.	Guha E, "Basic Thermodynamics", Narosa Publishers	2002

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN- 209** Course Title: **Digital Electronics and Circuits**

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

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

4. Relative Weight: **CWS: 20** **PRS: 20** **MTE: 20** **ETE: 40** **PRE: 00**

5. Credits: **3** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **PHN 102 (Analog Electronics)**

9. Objective:To introduceconcepts of Digital Electronics and Circuits

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Digital Principles and Logic** :Analog vs digital signals, Digital waveforms, Digital Operations, Digital Integrated Circuits, Basic Logic Gates, Universal Logic Gates, Overview of finite state machines, Introduction to HDL	6
2.	**Combinational Logic Circuits:**Boolean laws and theorems, Standard representations for logic functions(SOP and POS), Karnaugh map representation of logic functions, Simplification of logic functions using K-map, Don't care conditions	5
3.	**Data Processing Circuits:** Multiplexers, De-multiplxers, Decoders, Encoders, Parity generators and checkers	4
4.	**Digital Logic Families:**Bipolar and Unipolar logic families, Characteristics of Digital ICs, Resistor-Transistor logic, Transistor-Transistor Logic, Emitter-coupled logic, MOS logic, CMOS logic.	4
5.	**Number Systems and Codes:**Binary, Octal, Hexadecimal Numbers systems; Conversion from Binary, Octal, Hexadecimal to Decimal number system, Inter-conversion amongst Binary, Octal and Hexadecimal numbers. ASCII code, Excess code, Gray code	6
6	**Arithmatic Circuits:**Binary addition, subtraction, Unsigned and signed binary numbers, 2's compliment-representation and operations, Arithmetic building blocks, Arithmetic logic unit	6
7	**Flip-flops:** Concept of 1-bit memory cell, S-R, J-K, D, T flip-flops, Master-Slave J-K flip flop, Applications of flip-flops: Latch, Registers, Counters, Memories; Design and implementation.	7

8	**Timing Circuits :** Applications of logic gates in timing circuits, Schmitt trigger ICs, 555 timer	4
	Total	42

11. Suggested Books:

S. No.	Name of Authors /Books / Publishers	Year of Publication/ Reprint
1.	Leach DP, MalvinoAp, Saha G, "Digital Principles and Applications", 8th Ed. (third re-print). McGraw Hill Education	2015
2.	Jain RP, "Modern Digital Electronics", 4th Ed. McGraw Hill Education	2014
3.	Mano MM and Ciletti MD., "Digital Design", 4th Ed., Prentice-Hall	2006
4.	Floyd TL, " Digital Fundamentals ", 8th Ed., Pearson Education.	2005
5.	Kumar A.A., "Pulse and Digital Circuits", 2nd Ed., Prentice-Hall of India	2008

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT. /CENTRE: **DEPARTMENT OF PHYSICS**

1. Subject Code: **PHN-211** Course Title: **Quantum Physics**

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

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

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

5. Credits: **3** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **None**

9. Objective:To introduce the basic concepts of quantum mechanics and its applications

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Prelude to Quantum Mechanics:** Failures of classical physics; Energy quantization, Black body radiation, diffraction of matter particles, de Broglie waves and Davisson-Germer experiment, wave-particle duality, Angular momentum quantization: Stern-Gerlach experiment	08
2.	**Elements of Quantum Mechanics:** Time-dependent and time-independentSchrodinger equation, interpretation of the wave function, wave packets, stationary states; Heisenberg uncertainty principle, basic postulates and meaning of the measurement, expectation value, observables and operators, Hermitian operators, commutation relations, Dirac notation	12
3.	**Problems in one-dimension:** Particle in a box, potential step, potential barrier: reflection and transmission coefficients, tunnelingthrough multiple barriers: resonant tunneling; potential well, simple harmonic oscillator, raising and lowering operators	10
4.	**Problems in two dimensions:** Two-dimensional electron gas in a perpendicular magnetic field, Landau levels	04
5.	**Problems in three-dimensions:** Symmetry and conservation lawsin quantum mechanics, central potential, hydrogen atom, angular momentum and spherical harmonics	08
	Total	42

11. Suggested Books:

S. No.	Name of Authors /Books/ Publishers	Year of Publication/ Reprint
1.	Nouredine Zettili, "Quantum Mechanics : Concepts and Applications," Wiley	2009
2.	Griffiths D. J., "Introduction to Quantum Mechanics", Prentice Hall	1995
3.	Beiser A., "Concepts of Modern Physics", McGraw Hill	2009
4.	Gasiorowicz S, "Quantum Physics," John Wiley	2003
5.	Eisberg R. M., and Resnick R., "Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles", Wiley	1985
6.	Tyagi I. S., "Principles of Quantum Mechanics", Pearson Education	2013
7.	Band, Y. B., and Avishai, Y., "Quantum Mechanics with application to nanotechnology and information science", Elsevier	2012
8.	Singh, J., "Quantum Mechanics: Fundamentals and Applications to Technology", John Wiley & Sons Inc.	1997
9.	Levi, A. F. J., "Applied Quantum Mechanics," Cambridge Univ. Press	2006

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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

1. Subject Code: **PHN-505** Course Title: **Advanced Mathematical Physics**

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

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

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

5. Credits: **4** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **PHN-210 or equivalent**

9. Objective: **To familiarize the students with the standard techniques in modern mathematical physics**

1. Details of Course:

S. No.	Contents	Contact Hours
1.	Review of Special functions: Legendre, Bessel, Hermite and Laguerre functions and their applications.	6
2.	Green's functions and solutions to inhomogeneous differential equations of one-, two- and three-dimensions and their applications.	6
3.	Tensors, inner and outer products, contraction, symmetric and antisymmetric tensors, covariant and contravariant tensors, metric tensor, covariant derivatives, affine connections Christoffel symbols.	8
4.	Finite Groups: Classification and examples, subgroups, conjugacy classes, cosets, invariant subgroups, homomorphic and, isomorphc mappings, direct products.	8
5.	Representation theory for finite groups, reducible and irreducible representations, Schur's Lemma and orthogonality theorem.	6
6.	Continuous Groups: Characters; Lie Groups: SO(2), SO(3), SU(2), SU(3), Vector Spaces; Hilbert Space and operators.	8
	Total	**42**

11. Suggested Books:

S. No.	Name of Authors/ Books/Publishers	Year of Publication/Reprint
1.	Arfken G. B. and Weber H. J., "Mathematical Methods for Physicists" , 5th Ed. Academic Press.	2005
2.	Hassani, S., "Mathematical Physics: A modern Introduction to its foundations", 2nd Ed. Springer	2013
3.	Duffy, D. "Green's Functions with Applications", 2nd Ed. CRC Press	2015
4.	Bourne, D. E. and Kendall, P. C., "Vector Analysis and Cartesian Tensors", 3rd Ed., Springer Science	1992
5.	Cornwell, J. F., "Group Theory in Physics: An Introduction", Academic Press	1997
6.	Hammermesh M., "Group Theory and Applications to Physical Problems", Dover publications, NY.	1989
7.	Akhiezer N. I. and Glazman I. M., " Theory of Linear Operator in Hilbert Space", Dover Publications	1993

Item No. 69.30: To report the syllabus of MAN-657: Advanced Operations Research, as proposed by the Department of Mathematics.

On the recommendation of the 55th IAPC, the Chairman Senate has approved the syllabus of the course MAN-657: Advanced Operation Research as proposed by the Department of Mathematics and given in **Appendix 'A'.**

The above is reported to the Senate.

INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

NAME OF DEPTT./CENTER: **Department of Mathematics**

1. Subject Code: **MAN 657** Course Title: **Advanced Operations Research**

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

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

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

5. Credits: **4** 6. Semester: **Spring** 7. Subject Area: **PEC**

8. Pre–requisite: **Basic knowledge of Operations Research**

9. Objective: To acquaint the students with the advanced concepts of Operations Research.

10. Details of the course:

S. No.	Particulars	Contact Hours
1	Sequencing and Scheduling, CPM and PERT, Replacement and Depreciation Models.	7
2	Dynamic Programming: Discrete and Continuous Dynamic Programming, Bellman's Optimality Principle.	4
3	Nonlinear Programming, Convex Functions and their properties, Differentiable convex functions, Sub-gradients of convex functions, Generalization of convex functions.	8
4	The Fritz John and the Karush-Kuhn-Tucker optimality conditions, Problems with inequality and equality constraints, necessary and sufficient optimality conditions for constrained optimization problems, cone of tangents, polar cone, constraint qualifications.	8
5	Convex Quadratic Programming Problems, Wolfe's Method, Beale's Method, Separable Programming, Geometric Programming: Problems with positive coefficients upto one degree of difficulty, Generalized Method for Positive and Negative coefficients.	9
6	Multi-objective programming problems, Solution concepts, Efficient, Weak efficient and Properly efficient solutions, Goal Programming Problems, weighted sum approach, partition approach.	6
	TOTAL	**42**

11. Suggested Books:

S. No.	Name of Books/ Authors/ Publishers	Year of publication
1	Bazaraa, M. S., Sherali, H. D. and Shetty C. M., "Nonlinear Programming: Theory and Algorithms", 3 rd Edition, John Wiley & Sons.	2006
2	Mittal, K.V. and Mohan,C.: "Optimization Methods in System Analysis and Operations Research", New Age India Pvt. Ltd, New Delhi	1996
3	Pant,.J.C.: "Introduction to Optimization/ Operations Research", 7th Edition, Jain Brothers, New Delhi.	2012
4	Ravindran, A., Phillips, D.T. and Solberg, J.J., "Operations Research: Principles and Practice", 2nd Edition, John Wiley and Sons, NY.	2012
5	Taha, H.A.: "Operations Research: An Introduction", 9th Edition, MacMillan Pub Co., NY.	2013

Item No. 69.31: To report the course structure of Integrated M.Sc. (Physics) and Integrated M.Sc. (Chemistry) and syllabus of course CYN-101 Introduction of Chemical Science.

As per the recommendation of the 54th IAPC and follow-up action by Dean Academic Affairs the Chairman Senate has approved the following course structure and syllabus **(Appendix 'A')**:

1. Integrated M.Sc. (Physics)
2. Integrated M.Sc. (Chemistry)

and syllabus

1. CYN-101: Introduction of Chemical Science

The above is reported to the Senate.

New

Appendix-E

New
After consultation with Chemistry

PROGRAM CODE : **311 – Integrated M.Sc. Physics**
DEPARTMENT : **Department of Physics**
YEAR : **I**

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MAN-001	Mathematics - 1	**BSC**	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-101	Introduction to Physical Science	PCC	2	2	0	0	0	0	0	0	0	100	0
3.	PHN-103	Computer Programming	**ESC**	4	3	0	2	3	0	15	25	20	40	0
4.	CYN-001	Physical Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	0
5.	HSN-002	Ethics and Self Awareness	HSSC	2	1	1	0	2	0	25	0	25	50	0
6.	CEN-105	Introduction to Environmental Studies	GSC	3	3	0	0	3	0	25	0	25	50	0
7.	HSN-001A/B	Communication Skills (Basic / Advanced)	HSSC	2	1	0	2	2	0	25	0	25	50	0
		TOTAL		**21**										
(Spring)														
1.	MAN-102	Linear Algebra	**BSC**	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-008	Electromagnetic Theory	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-102	Analog Electronics	PCC	4	3	1	2/2	3	0	20	20	20	40	0
4.	PHN-104	Mechanics and Relativity	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	EEN-112	Electrical Science	**ESC**	4	3	1	0	3	0	25	0	25	50	0
6.	CYN-104	Organic and Inorganic Chemistry	**BSC**	4	3	0	2	3	2	15	25	20	40	0
		TOTAL		**24**										

DEPARTMENT : Department of Physics
YEAR : II

S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
				Teaching Scheme				**Contact Hours/Week**			**Exam Duration (Hrs.)**			**Relative Weights (%)**
				(Autumn)										
1.	MIN-003	Mechanical Engineering Drawing	ESC	4	2	0	4	0	4	0	50	0	0	50
2.	CYN-203	Coordination Chemistry and Organometallics	**BSC**	4	3	1	0	3	0	25	0	25	50	0
3.	PHN-207	Thermal and Statistical Physics	PCC	4	3	0	2	3	0	15	25	20	40	0
4.	PH-209	Digital Electronics and Circuits	PCC	4	3	1	2/2	3	0	20	20	20	40	0
5.	PHN-211	Quantum Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
6.	HSN-ELE	HSS Elective Course[1]	HSSMC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**22**										
				(Spring)										
1.	PHN-204	Atomic, Molecular and Laser Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
2.	PHN-206	Elements of Condensed Matter Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	PHN-208	Nuclear Physics and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	PHN-210	Mathematical Physics	PCC	3	3	0	0	3	0	25	0	25	50	0
5.	PHN-212	Applied Optics	PCC	4	3	0	2	3	2	15	25	20	40	0
6.	MTN-105	Electrical and Electronics Materials	**ESC**	4	3	1	0	3	0	25	0	25	50	0
		TOTAL		**20**										

PROGRAM CODE : 311 – Integrated M.Sc. Physics
DEPARTMENT : Department of Physics
YEAR : III

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MAN-205	Ordinary Differential Equations	**BSC**	4	3	1	0	3	0	25	-	25	50	-
2.	PHN-311	Numerical Analysis and Computational Physics	PCC	3	2	0	2	3	2	15	25	20	40	0
3.	PHN-315	Lasers & Photonics	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	PHN-317	Plasma Physics and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
5.	PHN-319	Technical Communication	PCC	2	0	0	0		0		50			50
6.	OEC/ BM-ELE	Open Elective Course/Management Studies Elective Course[2]	OEC/HSSMEC	3	2	1	0	2	0	25	0	25	50	-
		TOTAL		**18**										
(Spring)														
1.	PHN-310	Applied Instrumentation	PCC	3	3	0	2/2	3	-	15	25	20	40	0
2.	PHN-312	Properties of Matter and Acoustics	PCC	4	3	0	3	3	-	15	25	20	40	0
3.	PHN-314	Microprocessors and Peripheral Devices	PCC	4	3	0	2	3	-	15	25	20	40	0
4.	PHN-324	Nanotechnology	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	MAN-302	Mathematical Modeling and Simulation	**BSC**	4	3	1	0	3	0	25	0	25	50	0
6.	MSC1	Minor Specialization Course- I	MSC	3	0	0	0	0	0	0	0	0	0	0
		TOTAL		**19/18**										

PROGRAM CODE : 311 – Integrated M.Sc. Physics
DEPARTMENT : Department of Physics
YEAR : IV

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Semester- I (Autumn)														
1.	PH-503	Quantum Mechanics – I	PCC	4	3	1	0	3	0	25	0	25	50	0
2.	PH-505	Advanced Mathematical Physics	PCC	4	3	1	0	3	0	15	0	35	50	0
3.	PH-507	Classical Electrodynamics	PCC	4	3	1	0	3	0	25	0	25	50	0
4.	PH-509	Classical Mechanics	PCC	3	3	0	0	3	0	15	0	35	50	0
5.	PH-513	Semiconductor Devices and Applications	PCC	4	3	0	3	3	3	15	25	20	40	0
	MSC2	Minor Specialization Course- II	MSC	4										
		Total		19/ 23										
Semester-II (Spring)														
1.	PH-502	Laboratory Work	PCC	3	0	0	6	0	4	0	50	0	0	50
2.	PH-504	Condensed Matter Physics	PCC	3	3	0	0	3	0	25	-	25	50	-
3.	PH-506	Statistical Mechanics	PCC	3	3	0	0	3	0	25	-	25	50	-
4.	PH-508	Quantum Mechanics - II	PCC	3	3	0	0	3	0	25	-	25	50	-
5.	PH-512	Physics of Earth's Atmosphere	PCC	4	3	1	0	3	0	25	-	25	50	-
6.	PH-518	Elements of Nuclear and Particle Physics	PCC	4	3	1	0	3	0	25	0	25	50	0
7	MSC3	Minor Specialization Course- III	MSC	4										
		Total		20/ 24										

Program Code: **311 – Integrated M.Sc. Physics**
Department: **PH Physics**
Year: **V**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Semester- I (Autumn)														
1.	PH-699	Seminar	SEM	2	0	0	0	0	0	-	-	-	100	-
2.	PH-600A	Dissertation Stage I	DIS	3	0	0	0	0	0	-	-	-	100	0
3.	PHN-xxx	Departmental Elective – I	PEC	4	3	0	3	3	3	20	20	20	40	-
4.	PHN-xxx	Departmental Elective – II	PEC	4	3	1	0	3	0	25	-	25	50	-
5.	PHN-xxx	Departmental Elective – III	PEC	4	3	1	0	3	0	25	-	25	50	-
6.	PHN-xxx	Departmental Elective – IV	PEC	4	3	1	0	3	0	25	-	25	50	-
7	MSC-4	Minor Specialization Course-IV	MSC	4										
		Total		21/ 25	3	0	2							
Semester-II (Spring)														
1.	PHN-xxx	Departmental Elective – V	PEC	4	3	1	0	3	0	25	-	25	50	-
2.	PHN-xxx	Departmental Elective – VI	PEC	4	3	1	0	3	0	25	-	25	50	-
3	PH-600B	Dissertation Stage II	DIS	9	0	0	0	0	0	0	0	0	100	0
4	MSC-5	Minor Specialization Course-V	MSC	4										
		Total		17/ 21										

Year	BSC 16-28	ESC 16	HSSC 10	GSC 03	PCC(+SEM+DIS) 116-124	PEC 24-32	SEM 02	DIS 12	Discipline 02	NCC/NSO /NSS (02	NCC/NSO/NSS/ Proficiency 02	Total
1	16	8	4	3	14	-	-	-	-	2	-	47
2	4	8	3	-	27	-	-	-	-	-	-	42
3	4	-	3	-	26	-	-	-	-	-	-	33
4	-	-	-	-	35	-	-	-	-	-	-	35
5	-	-	-	-	-	24	2	12	2	-	2	42
Total	24	16	10	3	102+14=116	24	2	12	2	2	2	199

Program Elective Courses (M.Sc. Physics)

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Departmental Elective -I **(III Semester: One paper to be chosen)**														
1.	PHN-601	Advanced Condensed Matter Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
2.	PHN-603	Advanced Atmospheric Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
3.	PHN-605	Advanced Laser Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
4.	PHN-607	Advanced Nuclear Physics	PEC	4	3	0	3	3	0	20	20	20	40	0
Departmental Electives (III Semester: Three paper to be chosen & IV Semester: Two paper to be chosen)														
5.	PHN-602	Nuclear Astrophysics	PEC	4	3	1	0	3	0	25	-	25	50	-
6.	PHN-604	Physics of Nanosystems	PEC	4	3	1	0	3	0	25	-	25	50	-
7.	PHN-606	Superfluidity and Superconductivity	PEC	4	3	1	0	3	0	25	-	25	50	-
8.	PHN-608	Fiber and Nonlinear Optics	PEC	4	3	1	0	3	0	25	-	25	50	-
9.	PHN-610	Quantum Optics	PEC	4	3	1	0	3	0	25	-	25	50	-
10.	PHN-612	Advanced topics in Mathematical Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
11.	PHN-614	Introduction to Superstring theory	PEC	4	3	1	0	3	0	25	-	25	50	-
12.	PHN-616	Advanced Electroceramics Technology	PEC	4	3	1	0	3	0	25	-	25	50	-
13.	PHN-617	Advanced Characterization Techniques	PEC	4	3	1	0	3	0	25	-	25	50	-
14.	PHN-618	Atomic and Molecular Collision Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
15.	PHN-619	A Primer in Quantum Field Theory	PEC	4	3	1	0	3	0	25	-	25	50	-
16.	PHN-620	Advanced Quantum Field Theory	PEC	4	3	1	0	3	0	25	-	25	50	-
17.	PHN-621	Astrophysics	PEC	4	3	1	0	3	0	25	-	25	50	-
18.	PHN-622	Solar Terrestrial Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
19.	PHN-623	General Relativity	PEC	4	3	1	0	3	0	25	-	25	50	-
20.	PHN-624	Computational Nuclear Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
21.	PHN-625	Particle Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
22.	PHN-626	Advanced Atomic and Molecular Physics	PEC	4	3	1	0	3	0	25	-	25	50	-
23.	PHN-627	Quantum Theory of Solids	PEC	4	3	1	0	3	0	25	-	25	50	-
24.	PHN-629	Weather Forecasting	PEC	4	3	1	0	3	0	25	-	25	50	-
25.	PHN-631	Nuclear Instrumentation	PEC	4	3	1	0	3	0	25	-	25	50	-
26.	PHN-633	Physics and Technology of Thin Films	PEC	4	3	1	0	3	0	25	-	25	50	-
27.	PHN-635	Advanced Nuclear reactions	PEC	4	3	1	0	3	0	25	-	25	50	-

28.	PHN-637	Semiconductor Photonics	PEC	4	3	1	0	3	0	25	-	25	50	-
29.	PHN-638	Advanced Light Sources	PEC	4	3	1	0	3	0	25	-	25	50	-
30.	PNN-639	Superconducting Radio Frequency for particle accelerators	PEC	4	3	1	0	3	0	25	-	25	50	-

List of Minor Specialization courses of Physics for other Departments

					Teaching Scheme (Hrs./Week)			
	Subject Code	Course Title	Semester in which the course is running	Subject area	Credits	L	T	P
1	PHN-104	Mechanics and Relativity	Autumn	PCC/MSC	4	3	1	0
2	PHN-211	Quantum Physics	Autumn	PCC/MSC	4	3	1	0
3	PHN-204	Atomic Molecular and Laser Physics	Spring	PCC/MSC	3	3	0	0
4	PHN-206	Elements of Condensed Matter Physics	Spring	PCC/MSC	3	3	0	0
5	PHN-208	Nuclear Physics and Applications	Spring	PCC/MSC	3	3	0	0
				Total	17	15	2	0

New

Appendix-E

PROGRAM CODE : **xxx – Integrated M.Sc. Chemistry**
DEPARTMENT : **Department of Chemistry**
YEAR : **First Year**

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	MAN-001	Mathematics-I	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-101	Introduction to Chemical Science	PCC	2	2	0	0	0	0	0	0	0	100	0
3.	CYN-103	Computer Programming	ESC	4	3	0	2	3	0	15	25	20	40	0
4.	PHN-007	Modern Physics	BSC	4	3	0	2	3	0	15	25	20	40	0
5.	HSN-002	Ethics and Self Awareness	HSSC	2	1	1	0	2	0	25	0	25	50	0
6.	CEN-105	Introduction to Environmental Studies	GSC	3	3	0	0	3	0	25	0	25	50	0
7.	HSN-001A/B	Communication Skills (Basic/ Advanced)	HSSC	2	1	0	2	2	0	25	0	25	50	0
		TOTAL		**21**										
Spring Semester														
1.	MAN-002	Numerical Methods	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN- 008	Electromagnetic theory	BSC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-102	Physical Chemistry-I	PCC	4	3	0	2	3	2	15	25	20	40	0
4.	CYN-104	General Organic and Inorganic Chemistry	PCC	4	3	0	2	3	2	15	25	20	40	0
5.	CYN-106	Basic Analytical Chemistry	PCC	4	3	1	0	3	0	25	0	25	50	0
6.	CHN-102	Energy Engineering	ESC	4	3	1	0	3	0	25	0	25	50	0
		TOTAL		**24**										

125

PROGRAM CODE : xxx – Integrated M.Sc. Chemistry
DEPARTMENT : Department of Chemistry
YEAR : Second Year

S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
		Autumn Semester												
1.	BTN-201	Genetics and Molecular Biology	ESC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-201	Thermodynamics	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-203	Coordination Chemistry and Organometallics	PCC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN-205	Organic Chemistry-I	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	MAN-205	Ordinary and Partial Differential Equations	BSC	4	3	1	0	3	0	25	0	25	50	0
6.	HSS-ELE	HSS Elective Course	HSSC	3	0	0	3	0	25	0	25	50	0	0
		TOTAL		**23**										
		Spring Semester												
1.	MAN-102	Linear Algebra	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-214	Applied Optics	BSC	4	3	0	2	3	0	15	25	20	40	0
3.	MTN-208	Engineering Polymers and Composites	ESC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN-202	Main Group and Cluster Chemistry	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	CYN-204	Organic Chemistry-II	PCC	4	3	1	0	3	0	25	0	25	50	0
6.	CYN-206	Chemical Kinetics	PCC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**23**										

PROGRAM CODE : xxx – Integrated M.Sc. Chemistry
DEPARTMENT : Department of Chemistry
YEAR : Third Year

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-301	Quantum Chemistry and Chemical Bonding	PCC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-303	Advanced Coordination Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-305	Organic Chemistry-III	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-311	Laboratory I	PCC	6	0	0	12	0	4	0	25	25	0	50
5.	CYN-ELE1	Department Elective -1	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	BM-ELE/OEC	Open Elective Course/Management Studies Elective Course	OEC/HSSMEC	3	2	1	0	2	0	25	0	25	50	0
		TOTAL		**22**										
Spring Semester														
1.	CYN-302	Group Theory and Spectroscopy	PCC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-304	Solid State Chemistry and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-306	Organic Chemistry-IV	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-312	Laboratory II	PCC	6	0	0	12	0	4	0	25	25	0	50
5.	CYN-399	Educational Tour	PCC	0	0	0	0	0	0	0	0	0	0	0
6.	CYN-ELE2	Department Elective-2	PEC	3	3	0	0	3	0	25	0	25	50	0
7.	MSC-1	Minor Specialization Course-I	MSC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**19/ 22**										

PROGRAM CODE : **xxx – Integrated M.Sc. Chemistry**
DEPARTMENT : **Department of Chemistry**
YEAR : **Fourth Year**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-515	Art of Scientific/ Technical Writing	PCC	2	2	0	0	2	0	25	0	25	50	0
2.	CYN-521	Advanced Analytical Methods	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-523	Organic Chemistry-V	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-525	Advanced Molecular Spectroscopy	PCC	3	3	0	0	3	0	25	0	25	50	0
5	CYN-ELE3	Department Elective – 3	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	CYN-531	Laboratory-III	PCC	6	0	0	12	0	6	0	25	25	0	50
7.	MSC-2	Minor Specialization Course-II	MSC	3	3	0	0	0	0	0	25	25	50	0
		Total		**21/ 24**	17	1	12							
Spring Semester														
1.	CYN-522	Materials Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
2.	CYN-524	Frontier Inorganic Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-526	Organic Chemistry-VI	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-532	Laboratory-IV	PCC	6	0	0	12	0	6	0	25	25	0	50
5.	CYN-ELE4	Department Elective –4	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	CYN-ELE5	Department Elective – 5	PEC	3	3	0	0	3	0	25	0	25	50	0
7.	MSC-3	Minor Specialization Course-III	MSC	3	3	0	0	3	0	25	0	25	50	0
		Total		**21/ 24**	18	2	12							

PROGRAM CODE : **xxx – Integrated M.Sc. Chemistry**
DEPARTMENT : **Department of Chemistry**
Year: **Fifth Year**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-ELE6	Departmental Elective – 6	PEC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-ELE7	Departmental Elective – 7	PEC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN- 699	Seminar	PCC	2	0	1	4	0	0	0	0	0	100	0
5.	CYN-600	Dissertation Stage I*	DIS	0	0	0	6	0	0	0	0	0	0	0
		Total		**10**	6	3	10							
Spring Semester														
1.	CYN-600	Dissertation Stage II	PCC	12	0	0	24	0	0	0	0	0	100	0
2.	MSC-4	Minor Specialization Course-IV	MSC	3	3	0	0	3	0	25	0	25	50	0
3.	MSC-5	Minor Specialization Course-V	MSC	3	3	0	0	3	0	25	0	25	50	0
		Total		**12/ 18**	0/6	0	24							

*40% weightage will be given for stage I during the end term evaluation.

	Summary									
Semester	1	2	3	4	5	6	7	8	9	10
Semester-wise Total Credits	21	24	23	23	22	19(22)	21(24)	21 (24)	10	12(18)
Total Credits	196(212)									

No of credits for Integrated MSc = 196

No of Credits for Integrated MSc with MINOR SPECIALISATION = 211

Year	BSC 16-28	ESC 16	HSSC 10	GSC 03	PCC 116-122	MSC	PEC 24-32	SEM 02	DIS 12	Discipline 02	NCC/NSO /NSS 02	NCC/NSO/NSS/ Proficiency 02	Total
1	16	8	4	3	14	0	0	0	0	0	2	0	47
2	12	8	3	0	23	0	0	0	0	0	0	0	46
3	0	0	3	0	32	3	6	0	0	0	0	0	41(44)
4	0	0	0	0	33	6	9	0	0	0	0	0	42(48)
5	0	0	0	0	0	6	8	2	12	2	0	2	26(32)
Total	28	16	10	3	102	15	23	2	12	2	2	2	202(217)

Total No of credits for Integrated MSc = 196/202

No of Credits for Integrated MSc with MINOR SPECIALISATION = 211/217

New

Appendix-E

PROGRAM CODE : **xxx – Integrated M.Sc. Chemistry**
DEPARTMENT : **Department of Chemistry**
YEAR : **First Year**

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	MAN-001	Mathematics-I	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-101	Introduction to Chemical Science	PCC	2	2	0	0	0	0	0	0	0	100	0
3.	CYN-103	Computer Programming	ESC	4	3	0	2	3	0	15	25	20	40	0
4.	PHN-007	Modern Physics	BSC	4	3	0	2	3	0	15	25	20	40	0
5.	HSN-002	Ethics and Self Awareness	HSSC	2	1	1	0	2	0	25	0	25	50	0
6.	CEN-105	Introduction to Environmental Studies	GSC	3	3	0	0	3	0	25	0	25	50	0
7.	HSN-001A/B	Communication Skills (Basic/ Advanced)	HSSC	2	1	0	2	2	0	25	0	25	50	0
		TOTAL		**21**										
Spring Semester														
1.	MAN-002	Numerical Methods	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN- 008	Electromagnetic theory	BSC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-102	Physical Chemistry-I	PCC	4	3	0	2	3	2	15	25	20	40	0
4.	CYN-104	General Organic and Inorganic Chemistry	PCC	4	3	0	2	3	2	15	25	20	40	0
5.	CYN-106	Basic Analytical Chemistry	PCC	4	3	1	0	3	0	25	0	25	50	0
6.	CHN-102	Energy Engineering	ESC	4	3	1	0	3	0	25	0	25	50	0
		TOTAL		**24**										

PROGRAM CODE : xxx – Integrated M.Sc. Chemistry
DEPARTMENT : Department of Chemistry
YEAR : Second Year

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	BTN-201	Genetics and Molecular Biology	ESC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-201	Thermodynamics	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-203	Coordination Chemistry and Organometallics	PCC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN-205	Organic Chemistry-I	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	MAN-205	Ordinary and Partial Differential Equations	BSC	4	3	1	0	3	0	25	0	25	50	0
6.	HSS-ELE	HSS Elective Course	HSSC	3	0	0	3	0	25	0	25	50	0	0
		TOTAL		**23**										
Spring Semester														
1.	MAN-102	Linear Algebra	BSC	4	3	1	0	3	0	25	0	25	50	0
2.	PHN-214	Applied Optics	BSC	4	3	0	2	3	0	15	25	20	40	0
3.	MTN-208	Engineering Polymers and Composites	ESC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN-202	Main Group and Cluster Chemistry	PCC	4	3	1	0	3	0	25	0	25	50	0
5.	CYN-204	Organic Chemistry-II	PCC	4	3	1	0	3	0	25	0	25	50	0
6.	CYN-206	Chemical Kinetics	PCC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**23**										

PROGRAM CODE : xxx – Integrated M.Sc. Chemistry
DEPARTMENT : Department of Chemistry
YEAR : Third Year

Teaching Scheme				Contact Hours/Week				Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-301	Quantum Chemistry and Chemical Bonding	PCC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-303	Advanced Coordination Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-305	Organic Chemistry-III	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-311	Laboratory I	PCC	6	0	0	12	0	4	0	25	25	0	50
5.	CYN-ELE1	Department Elective -1	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	BM-ELE/OEC	Open Elective Course/Management Studies Elective Course	OEC/HSSMEC	3	2	1	0	2	0	25	0	25	50	0
		TOTAL		**22**										
Spring Semester														
1.	CYN-302	Group Theory and Spectroscopy	PCC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-304	Solid State Chemistry and Applications	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-306	Organic Chemistry-IV	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-312	Laboratory II	PCC	6	0	0	12	0	4	0	25	25	0	50
5.	CYN-399	Educational Tour	PCC	0	0	0	0	0	0	0	0	0	0	0
6.	CYN-ELE2	Department Elective-2	PEC	3	3	0	0	3	0	25	0	25	50	0
7.	MSC-1	Minor Specialization Course-I	MSC	3	3	0	0	3	0	25	0	25	50	0
		TOTAL		**19/ 22**										

PROGRAM CODE : xxx – Integrated M.Sc. Chemistry
DEPARTMENT : Department of Chemistry
YEAR : Fourth Year

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-515	Art of Scientific/ Technical Writing	PCC	2	2	0	0	2	0	25	0	25	50	0
2.	CYN-521	Advanced Analytical Methods	PCC	4	3	1	0	3	0	25	0	25	50	0
3.	CYN-523	Organic Chemistry-V	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-525	Advanced Molecular Spectroscopy	PCC	3	3	0	0	3	0	25	0	25	50	0
5	CYN-ELE3	Department Elective – 3	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	CYN-531	Laboratory-III	PCC	6	0	0	12	0	6	0	25	25	0	50
7.	MSC-2	Minor Specialization Course-II	MSC	3	3	0	0	0	0	0	25	25	50	0
		Total		**21/ 24**	17	1	12							
Spring Semester														
1.	CYN-522	Materials Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
2.	CYN-524	Frontier Inorganic Chemistry	PCC	3	3	0	0	3	0	25	0	25	50	0
3.	CYN-526	Organic Chemistry-VI	PCC	3	3	0	0	3	0	25	0	25	50	0
4.	CYN-532	Laboratory-IV	PCC	6	0	0	12	0	6	0	25	25	0	50
5.	CYN-ELE4	Department Elective –4	PEC	3	3	0	0	3	0	25	0	25	50	0
6.	CYN-ELE5	Department Elective – 5	PEC	3	3	0	0	3	0	25	0	25	50	0
7.	MSC-3	Minor Specialization Course-III	MSC	3	3	0	0	3	0	25	0	25	50	0
		Total		**21/ 24**	18	2	12							

PROGRAM CODE : **xxx – Integrated M.Sc. Chemistry**
DEPARTMENT : **Department of Chemistry**
Year: **Fifth Year**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	CYN-ELE6	Departmental Elective – 6	PEC	4	3	1	0	3	0	25	0	25	50	0
2.	CYN-ELE7	Departmental Elective – 7	PEC	4	3	1	0	3	0	25	0	25	50	0
4.	CYN- 699	Seminar	PCC	2	0	1	4	0	0	0	0	0	100	0
5.	CYN-600	Dissertation Stage I*	DIS	0	0	0	6	0	0	0	0	0	0	0
		Total		**10**	6	3	10							
Spring Semester														
1.	CYN-600	Dissertation Stage II	PCC	12	0	0	24	0	0	0	0	0	100	0
2.	MSC-4	Minor Specialization Course-IV	MSC	3	3	0	0	3	0	25	0	25	50	0
3.	MSC-5	Minor Specialization Course-V	MSC	3	3	0	0	3	0	25	0	25	50	0
		Total		**12/ 18**	0/6	0	24							

*40% weightage will be given for stage I during the end term evaluation.

	Summary									
Semester	1	2	3	4	5	6	7	8	9	10
Semester-wise Total Credits	**21**	**24**	**23**	**23**	**22**	**19(22)**	**21(24)**	**21 (24)**	**10**	**12(18)**
Total Credits	**196(212)**									

No of credits for Integrated MSc = 196

No of Credits for Integrated MSc with MINOR SPECIALISATION = 211

Year	BSC 16-28	ESC 16	HSSC 10	GSC 03	PCC 116-122	MSC	PEC 24-32	SEM 02	DIS 12	Discipline 02	NCC/NSO /NSS 02	NCC/NSO/NSS/ Proficiency 02	Total
1	16	8	4	3	14	0	0	0	0	0	2	0	**47**
2	12	8	3	0	23	0	0	0	0	0	0	0	**46**
3	0	0	3	0	32	3	6	0	0	0	0	0	**41(44)**
4	0	0	0	0	33	6	9	0	0	0	0	0	**42(48)**
5	0	0	0	0	0	6	8	2	12	2	0	2	**26(32)**
Total	**28**	**16**	**10**	**3**	**102**	**15**	**23**	**2**	**12**	**2**	**2**	**2**	**202(217)**

Total No of credits for Integrated MSc = 196/202

No of Credits for Integrated MSc with MINOR SPECIALISATION = 211/217

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Department of Chemistry**

1. Subject Code: CY-101 Course Title: **Introduction to Chemical Science**

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

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

4. Relative Weightage: **CWS 0 PRS 0 MTE 0 ETE 100 PRE 0**

5. Credits: **2** 6. Semester: **Autumn** 7.Subject Area: **PCC**

8. Pre-requisite: **None**

9. Objective: To develop interest and aptitude in chemistry

10. Details of the Course:

S. No.	Contents	Contact Hours
1.	**Chemistry, then and now**: Evolution of chemistry starting from alchemist to the modern chemistry, opportunities in chemistry, important discoveries in chemistry and their impact in society	4
2.	**Safety and hazards :** Introduction to a chemistry laboratory, general safety precautions, understanding and handling of air and moisture sensitive, pyrophoric, spontaneously flammable and shock sensitive compounds, case studies of laboratory accidents	4
3.	**Chemistry inspired by nature:** Colors: Origin of colors, natural and artificial colors; Foods and drugs: Ripening of food, food stabilizers, non-nutritional sweeteners, important drugs and their action, Flavors and fragrances; Polymers: Natural and synthetic polymers, biodegradable polymers, conducting polymers and their applications; Artificial photosynthesis	8
4.	**Chemical reactions in life processes:** Redox chemistry in cell, Trans-amination in amino acids, carbonate insertion in cell, Antioxidants in cell, ribose chemistry, Neurotransmitters	4
5.	**Recent advances and future prospects in chemistry:** Green chemistry, combinatorial chemistry lasers in chemistry, multifunctional molecules and materials, liquid crystals, light emitting diodes, molecular machines, nanomaterials, enzyme engineering for energy, fluorescent proteins, new methods of drug discovery, anti-aging projects, biomimetic analogues in medicines, personalized medicines, catalytic processes in energy conversions.	8
	Total	28

11. **Suggested Books**

S. No.	Name of Authors /Books/Publishers	Year of Publication
1.	*The Chemistry Book: From Gunpowder to Graphene, 250 Milestones in the History of Chemistry*, Lowe, D. B., Sterling Publishing Company, ISBN 1454911808	2016
2.	*Laboratory Safety for Chemistry Students*,Hill, Jr., R. H., Finster, D. C., John Wiley& Sons, Inc.	2010
3.	*Organic Chemistry*, J. Clayden, N. Greeves, S. Warren, P. Wothers, Oxford University Press	2009

Item No. 69.32: To report the extension of IITR Assistantship to research scholars till defence.

On the recommendation of the 10th IRC, the Chairman Senate has approved that IITR Assistantship to research scholars may be extended up to the viva-voce Examination on the recommendation of supervisor. This is subject to their registration in those semester(s). However, in any case, the assistantship cannot be given beyond five years as per the guidelines of MHRD (copy of notification is placed as **Appendix 'A').**

The above is reported to the Senate.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE

No. Acd. / 4409 /UG-15 Dated: 09th March, 2017.

NOTIFICATION

This is hereby notified that the Director is pleased to approve that fellowship may be given to research scholars in subsequent semester(s) after submission of thesis subject to their registration in those semester(s) on recommendation of supervisor upto the viva-voce Examination. However, in any case, the fellowship cannot be given beyond five years.

The above will be implemented w.e.f. July 01, 2017.

09/3/17

Asstt. Registrar (Academic Research)

Copy to:-

1. Dean, Academics.
2. Dean, Finance & Planning.
3. All Heads of Departments/Centres.
3. A.R. to Director for kind information of the Director.

Item No. 69.33: To report the extension granted to Mr. Ajay Jain, Enrolment No. 10114002 B. Tech. (CSE).

On the recommendation of the 55th IAPC, the Chairman Senate has granted Mr. Ajay Jain, Enrolment No. 10114002, B. Tech. (CSE) an extension for two semesters to complete the degree requirements. He has already completed seven years in the programme and has medical issues.

The above is reported to the Senate.

Item No. 69.34: To report the extension granted to Mr. Supandeep Singh, B. Tech. (P&P) for re-examination in the course PEN-352.

On the recommendation of the 55th IAPC, the Chairman Senate allowed Mr. Supandeep Singh, B. Tech. (P&P) for re-examination in the course PEN-352 as he has completed seven years and only this course was left for completing the requirements of the degree.

The above is reported to the Senate.

Item No. 69.35: To report the action on mercy appeals by Mr. Narender Kumar, M.Tech. II year (Geological Technology) and Ms. Saloni Agarwal, Integrated M.Tech. I year (Geological Technology).

On the recommendation of the Institute Standing Committee on Unfair Means the Chairman Senate has approved the registration of both students in the Autumn semester 2017-18 with a maximum of 50% of the credits allowed.

The above is reported to the Senate.

Item No. 69.36: To report the syllabi of courses related to Department of Humanities & Social Sciences and Centre of Excellence in Disaster Mitigation and Management.

(i) On the recommendation of the 54th IAPC, the Chairman Senate has approved the syllabi of following Elective courses of M.Sc. (Economics) proposed by the Department of Humanities & Social Sciences **(Appendix 'A')**:

1. HSN-601: Issues of Indian Economy
2. HSN-602: Introduction to Research Methodology
3. HSN-603: Industrial Economics
4. HSN-604: Ecological Economics
5. HSN-605: Financial Economics
6. HSN-606: Labour Economics
7. HSN-607: Advanced Topics in Growth Theory.

(ii) On the recommendation of 54th IAPC, the Chairman Senate has approved the revised syllabus of DMN-611: Nuclear Physics for Disaster Mitigation proposed by the Centre of Excellence in Disaster Mitigation & Management **(Appendix 'B').**

The above is reported to the Senate.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
NAME OF DEPT. /CENTRE: **Humanities and Social Sciences**

1. Subject Code: **HSN 601** Course Title: **Issues in Indian Economy**

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: **Autumn/Spring** 7.Subject Area: **PEC**

8. Pre-requisite: **Nil**

9. Objective: To acquaint students with the contemporary dynamics of the Indian economy and encourage the development of diverse research interests.

10. Details of Course

S. No.	Contents	Contact hours
1	**Introduction and Features**: Changing structure of the Indian economy since independence; Economic planning: objectives, strategies, policies and achievements under different five-year plans; Changing paradigms of development strategies and economic reforms.	5
2	**Poverty, Inequality and Employment:** Various concepts and estimates of poverty; Income inequality; Problems of unemployment; Interface among growth, poverty and employment; Inclusive growth and Human Development.	7
3	**Demographic Issues:** Demographic trends, size and structure of population; Health and Education; Skill challenges and demographic dividends.	4
4	**Perspectives in Agriculture, Industry and Services**: Agricultural growth performance, price policy, food management and food security; Growth, trends and changing pattern of Indian industries, industrial reforms and policies; Services in India's growth process.	7
5	**External Sector and Issues in Indian Public Finance:** Foreign trade and trade policy; Indian Union Budget and Tax System.	5
	Total	28

11. Suggested Books

S. No.	Name of Books/Author/Publisher	Year of Publication/ Reprint
1	Uma Kapila, *Indian Economy – Performance and Policies*, Academic Foundation, New Delhi, 16th Edition	2015
2	Uma Kapila, *Indian Economy Since Independence*, Academic Foundation, New Delhi, 27th Edition	2016
3	Gaurav Datt, and Ashwani Mahajan, *Indian Economy*, S Chand Publication, New Delhi, 70th Edition	2016
4	V K Puri, and S K Misra, *Indian Economy 2016-17*, Himalaya Publishing House, New Delhi, 34th Edition	2016

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE: Humanities and Social Sciences

1. Subject Code: **HSN 602** Course Title: **Introduction to Research Methodology**

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: **Autumn/Spring** 7. Subject Area: **PEC**

8. Pre-requisite: **Nil**

9. Objective: To acquaint students with various research tools and techniques used in economic analysis.

10. Details of Course:

S. No.	Contents	Contract Hours
1	**Research Design and Process:** Objectives and types of research; Research process; Important concepts relating to research design; Different research designs.	3
2	**Methods of Data Collection:** Types and sources of secondary data; Extraction of unit level data; Methods of primary data collection; Sampling methods and design; Sample size and its determination.	6
3	**Measurement and Scaling Techniques:** Measurement scales; Sources of error in measurement; Techniques of developing measurement tools; Scale classification basis; Scaling techniques and scale construction.	4
4	**Hypothesis Testing:** Parametric and Non-parametric tests	5
5	**Multivariate Data Analysis Techniques:** Factor Analysis; Discriminant Analysis; MANOVA; Cluster Analysis.	5
6	**Developing Research Proposal, Data Interpretation and Report Writing:** Design of research proposal; Techniques of data interpretation; Mechanics of report writing; Steps in writing report; Layout of the Research report; Types of reports; Oral presentation; Precautions for writing research reports.	5
	Total	28

11. Suggested Books

S. No.	Author (s)/Title/ Publisher	Year of Publication/ Reprint
1	Panneerselvam, R, *Research Methodology*, PHI Learning Private Limited, New Delhi, 2nd Edition	2013
2	Kothari, C.R., *Research Methodology: Methods and Techniques*, New Age	2013
3	Neuman, L.W., *Social Research Methods: Qualitative and Quantitative Approaches*, Pearson Education, 7th Edition	2014
4	Creswell, J.W., *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, Sage South Asia, 3rd Edition	2011
5	Bryman, A., *Social Research Methods*, Oxford University Press India, 4th Edition	2014

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
NAME OF DEPT./CENTRE: Humanities and Social Sciences

1. Subject Code: **HSN 603** Course Title: **Industrial Economics**

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 **TE** 50 **RE** 0

5. Credits: 3 6. Semester: **Autumn/Spring** 7. Subject Area: **PEC**

8. Pre-requisite: Knowledge of Microeconomics I & II and Mathematics for Economists

9. **Objective**: To familiarize students with the behaviour and performance of firms in markets, with a particular focus on strategic interactions, market power, and their impact on consumers and policy-makers.

10. Details of the Course

S. No.	Contents	Contact hours
1	**Firms, Consumers and Markets:** Defining a *firm*; Consumers as rational being; Welfare analysis of market outcomes; Definition of markets; The perfectly competitive paradigm; Imperfect competition; Concepts of strategies; Models and material of markets and strategies.	4
2	**Static and Dynamic Imperfect Competition:** Price competition; Bertrand model, Price competition with uncertain costs, Price competition with differential products; Quantity competition; Cournot model, Price versus quantity competition; Stackelberg model; Free entry; Endogenous number of firms, Industry concentration and Firm turnover.	6
3	**Product Differentiation:** Horizontal and Vertical product differentiation; Empirical analysis of product differentiation; Advertising and competition; Advertising and social welfare.	4
4	**Market Power, Competition and Efficiency:** Definition of market in competition analysis; Small but significant and non-transitory increase in price (SSNIP) or the hypothetical monopolist test; Assessment of market power – traditional vs econometric approach; Market power and welfare; Allocative and productive efficiency; Competition and incentives.	6
5	**Collusion and Horizontal Agreements, Horizontal Mergers, Vertical Restraints and Mergers:** Structure-Conduct-Performance hypothesis (Bain Sylos-Labini and extensions); Competition in markets with horizontal and vertical product differentiation; Competition in markets	4

	with large sunk costs; Market concentration (Sutton approach); Measurement of market concentration and coefficients of product differentiation.	
6	**Barriers to Entry and Other Abusive Practices:** Strategic barriers to entry; Predatory pricing; Non price monopolization practices; Price discrimination; Sunk costs as barriers to entry and exit.	4
	Total	28

11. Suggested Books

S. No.	Name of Books/Author/Publisher	Year of Publication/ Reprint
1	Motta, M., *Competition Policy: Theory and Practice*. Cambridge University Press	2004
2	Carlton, D. W. and Perloff, J. M., *Modern Industrial Organization*, Prentice Hall, 4th Edition	2004
3	Cabral, L. M. B., *Introduction to Industrial Organization*, The MIT Press, 1st Edition	2000
4	Tirole, J., *The Theory of Industrial Organization*, The MIT Press, 1st Edition	1988
5	Lipczynski, J., Wilson, J. O. S., and Goddard, J., *Industrial Organization: Competition, Strategy and Policy*, Pearson, 4th Edition	2013
6	Belleflamme, P. and Peitz, M., *Industrial Organization: Markets and Strategies*, Cambridge University Press, 2nd Edition	2015

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE: **Humanities and Social Sciences**

1. Subject Code: **HSN 604** Course Title: **Ecological Economics**

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: **Autumn/Spring** 7. Subject Area: PEC

8. Pre-requisite: Knowledge of Environmental Economics

9. Objective: To develop a clear understanding of the principles and applications of ecological economics and appraise the interdependence of the economy and the natural environment.

10. Details of the Course:

S. No.	Contents	Contract Hours
1	**Ecology and Economics**: Definitions; Relationship between ecological economics and environmental economics; Ecological and neoclassical economics, open and closed systems; Full and empty world; Diminishing marginal returns, optimal scale, and uneconomic growth - a paradigm shift; Ends and means- strategy for integrating ecology and economics.	6
2	**Sustaining Ecosystems**: The laws of thermodynamics; Entropy, life and economics; Stock-Flow resources and Fund-Service resources; Biotic resources- ecosystem structure and function; Renewable resources, sustainable yield, and carrying capacity; Ecosystem services, waste absorption capacity; Discounting and intergenerational equity.	7
3	**Social Costs and Ecosystem Valuation**: Valuation tools, market techniques and their critiques; Payment for ecosystem services; Valuing ecosystem services and biodiversity- The economics of ecosystem services and biodiversity (TEEB); Reducing emissions from deforestation and forest degradation (REDD), REDD+, carbon credit.	6
4	**Green Accounting**: Input-output accounting and the environment; National income accounting- Natural resource balance sheets, satellite accounting, natural resource accounting in India.	6

5	**Major Principles and Conventions**: Sustainable development principle-the Brundtland report, The United Nations Conference on Environment and Development, The World Submit on Sustainable Development, The United Nations Framework on Climate Change (UNFCC)–Operationalising the principle.	3
	Total	28

Suggested Books

Sl. No.	Author (s)/Title/ Publisher	Year of Publication/ Reprint
1	Daly, H.E. and Farley J., *Ecological Economics: Principles and Applications*, 2nd edition, Island Press	2004
2	Common, M. and Stagl, S., *Ecological Economics: An Introduction*, Cambrige University Press	2005
3	Daly, H.E., Cobb J.B., and Cobb, C. W., *For the Common Good: Redirecting the Economy toward Community, the Environment and a Sustainable Future*, Beacon Press	1994
4	Barkin, J.S., *Discounting the Discount Rate: Ecocentricism and Environmental Economics*, Global Environmental Politics	2006
5	Kumar, P., *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations*, Routledge, 1st Edition	2012

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
NAME OF DEPT./CENTRE: Humanities and Social Sciences

1. Subject Code: **HSN 605** Course Title: **Financial Economics**

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: Autumn/Spring 7.Subject Area: PEC

8. Pre-requisite: Knowledge of Microeconomics; Macroeconomics; and Money, Banking and Financial Markets

9. Objective: To discuss the role of economics in finance and provide an in-depth introduction to the theories of asset pricing and corporate finance.

10. Details of Course:

S. No.	Contents	Contract Hours
1	**Decision Making Under Uncertainty:** Expected utility; Risk aversion; Insurance premium; Risky assets.	2
2	**Stochastic Dominance and Discrete Time Asset Valuation:** First order and second order stochastic dominance; Mean preserving spreads; Arrow-Debreu economy and state contingent claims; Risk sharing and aggregation; Introduction to options, forwards and futures.	6
3	**Portfolio Performance Evaluation:** Analyzing portfolio return and risk; Portfolio weights; Abnormal returns; Risk-adjusted performance measures (Sharpe, Treynor, Jensen, Modigliani squared); Two-security portfolio; Diversification; Efficient and minimum variance portfolio; Optimal portfolio choice; Markowitz mean-variance (M-V) efficient frontier of risky and risk-free asset.	5
4	**Asset Pricing Models:** Index models of asset returns-single and multi-index models; Capital asset pricing model (CAPM)-inter-temporal and continuous; Security market line, Alpha vs. beta; Arbitrage pricing theory and linear factor models.	5
5	**Financial Markets With Imperfections:** Market Incompleteness Consumption and Portfolio Choice; Equilibrium Pricing; Efficient	4

	Market Hypothesis: implications, empirical tests, and challenges to efficient market hypothesis.	
6	**Behavioral Finance**: Heuristics and biases; Self-deception: Prospect theory and mental accounting; Emotional factors and social forces; Adaptive market hypothesis.	6
	Total	28

11. Suggested Books

S.No.	Author (s)/Title/ Publisher	Year of Publication/ Reprint
1	Bodie, Z., Kane, A., and Alan J. Marcus, *Investments*, McGraw-Hill, 10th edition	2015
2	Mishkin, F., *The Economics of Money, Banking and Financial Markets-Business School Edition*, Pearson, 3rd Edition	2015
3	Pilbeam, K., *Finance and Financial Markets*, Palgrave, 3rd Edition	2010
4	Fabozzi, F., Neave., E.H., and Zhou, G., *Financial Economics*, Wiley	2012
5	Huang, Chi-fu., and Litzenberger, R.H., *Foundations for Financial Economics*, Prentice Hall, Facsimile edition	1988
6	Chandra, P., *Behavioral Finance*, McGraw Hill, 1st Edition	2016

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
NAME OF DEPT. /CENTRE: **Humanities and Social Sciences**

1. Subject Code: **HSN 606** Course Title: **Labour Economics**

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: **Autumn/Spring** 7.Subject Area: **PEC**

8. Pre-requisite: **Nil**

9. Objective: To acquaint students with the theory and practice of labour economics and to develop their research interests in various labour market issues.

10. Details of Course

S. No.	Contents	Contact hours
1	**Evolution and Growth of Labour Economics**: The actors in the labour market; Need for labour market theories.	2
2	**Labour Supply and Demand**: Neoclassical model of labour supply; The household production model of labour supply; The hours of work decision; Neoclassical model of labour demand: Employment decision in short-run and long-run, elasticity of demand for labour and its applications.	7
3	**Labour Market Equilibrium:** Equilibrium in a single competitive market, competitive equilibrium across labour markets; The Cobweb model; Non-competitive labour markets: Monopsony.	7
4	**Human Capital and Labour Market Discriminations:** Education in the labour market: The schooling model, education and earning, estimating the rate of return to schooling; Wage structure and compensating wage differential: The Hedonic wage function; Worker mobility, Pay and Productivity; Labour market discrimination and Labour union.	8
5	**Labour Market Dynamics in India**: Contemporary policy issues; minimum wage laws, labour market discrimination; Employment training programs, and the economic impact of unions.	4
	Total	28

11. Suggested Books

S. No.	Name of Books/Author/Publisher	Year of Publication/ Reprint
1	Borjas. George, J, *Labor Economics*, McGraw-Hill: New York, 6th Edition	2012
2	Cahuc, Pierre, and Andre Zilberberg, *Labor Economics*, MIT Press: Cambridge, Mass. and London 2nd Edition	2014
3	Sandrine Caze and Sher Verick, *Perspectives on Labour Economics for Development*, Academic Foundation, New Delhi	2013
4	Campbell McConnell, Stanley Brue and David Macpherson, *Contemporary Labor Economics*-McGraw-Hill Education, New York, 11th Edition	2016
5	Ronald G Ehrenberg and Robert S. Smith, *Modern Labor Economics: Theory and Public Policy*, Prentice Hall, 11th Edition	2011
6	Ben Fine, *Labour Market Theory- A Constructive Reassessment*, Routledge, 1st Edition	2013

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
NAME OF DEPT. /CENTRE: **Humanities and Social Sciences**

1. Subject Code: **HSN 607** Course Title: **Advanced Topics in Growth Theory**

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: **Autumn/Spring** 7.Subject Area: **PEC**

8. Pre-requisite: Knowledge of Development Economics and Macroeconomics II

9. Objective: To prepare the students with the theoretical understanding and empirical application of modern theories of economic growth.

10. Details of Course

S. No.	Contents	Contact hours
1	**Neoclassical Growth Model**: Neoclassical growth theory - Hicks, Harrods, and Solow neutral technical change; Convergence; Growth in the long run; Kaldor's 'stylized facts' of economic growth	5
2	**Structural Change and Economic Growth**: Structural change and balanced trade; Structural change and unbalanced trade; Balassa-Samuelson implications; Structural change and labour market; Structural change and aggregate productivities	5
3	**Innovation, Technological Change and Growth**: Different conceptions of technology; Value of innovation in partial equilibrium; Dixit-Stiglitz model and aggregate demand externalities; Schumpeterian growth theory, step-by-step innovations; Endogenous growth theory on technical change, endogenous labour-augmenting technological change; Directed technological change	7
4	**Trade and Growth**: Growth and flows of goods, services and financial capital; Economic growth in H-O world; Factor-price and income equalization; Technology diffusion and product cycle; Learning-by-doing; Trade and growth	6
5	**Political Economy of Growth**: Determinants of democracy; Alternative institutional trajectories and their relationship with economic performance; State ownership and regulation; Government failures; Canonical Cobb-Douglas model of distributional conflict and the median voter	5
	Total	28

11. Suggested Books/Readings

S. No.	Name of Books/Author/Publisher	Year of Publication/ Reprint
1	Aghion P. and P. Howitt, *The Economics of Growth*, Prentice Hall India Learning Private Limited, New Delhi.	2010
2	Ray, Debraj, *Development Economics*, Oxford University Press, New Delhi.	2009
3	Amartya Sen, *Development as Freedom*, Oxford University Press.	2001
4	Daron Acemoglu and James Robinson, *Economic Origins of Dictatorship and Democracy*, Cambridge University Press, Reprint Edition.	2009

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT: **Centre of Excellence in Disaster Mitigation & Management**

1. Subject Code: **DMN-611** Course Title: **Nuclear Physics for Disaster Mitigation**

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

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

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

5. Credits: **4** 6. Semester: **Autumn/ Spring** 7. Subject Area: **PEC**

8. Pre-requisite: **Nil**

9. Objective of Course: To familiarize the students with the basics of nuclear physics and related instrumentation useful in dealing with nuclear disasters.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Radioactivity:** Sources of radioactivity, decay schemes, fossil, cosmogenic and artificial radioactivity. Interaction of radiation with matter: Heavy charged particles, electrons, positrons, photons and neutrons, Counting statistics, Error analysis. Radiation exposure, dose units and their conversion, safe levels and risk factors for various radiations, dosimeters.	10
2.	**Nuclear reactions:** Kinematics of nuclear reactions, cross sections, centre of mass and laboratory frames. Radiation detectors and spectroscopy: Modes of detector operation, gas-filled detectors, Geiger counters, scintillation detectors, gamma spectroscopy, pulse processing and analysis, applications in security.	8
3.	**Fission and Fusion:** Nuclear fission, fission products, neutrons emitted in fission, fission cross sections, energy distribution in fission, General consideration on fusion reactions, ITER project.	4

4.	**Nuclear reactors:** Neutron diffusion and moderation, heat generation and heat flow in reactors, heat removal from nuclear reactors, energy production, different types of nuclear reactors (Slab reactor, thermal reactor, reflected reactor), reactor licensing, Radioactive waste disposal, fission product poisoning, radiation shielding, safety and the environment. Nuclear energy in India and around the world	12
5.	**Nuclear disasters:** Potential consequences (ecology, economic, human, legal), Post-disaster actions, Causes for disasters, Types of radiation accidents, Statistics of radiation accidents, Three-mile island, Chernobyl, Fukushima	8
	Total	**42**

11. Suggested Books:

S. No.	Name of Authors /Books / Publishers	Year of Publication/ Reprint
1.	G. F. Knoll, "Radiation detection and Measurement", 4th Ed. John Wiley and Sons.	2010
2.	Gad Shani, "Radiation Dosimetry", 2nd Ed., CRC Press	2000
3.	Nicholas Tsoulfanidis, "Measurement and Detection of Radiation", 2nd Ed. Taylor and Francis.	1995
4.	John R. Lamarsh, Anthony J. Baratta, "Introduction To Nuclear Engineering", Prentice Hall.	2001
5.	Irving Kaplan, "Nuclear Physics", 2nd Ed., Adison-Wiley Company	2002
6.	James Mahaffey, "Atomic Accidents: A History of Nuclear Meltdowns and Disasters: From the Ozark Mountains to Fukushima", Open Road Media.	2014

Item No. 69.37: To report the action on the request of Ms. Nidhi (16925005), Research Scholar, I year, to convert her Credit Course into Audit Course for continuing in the Ph.D. programme.

On the recommendation of the 14th IRC, the Chairman Senate has approved the continuation of her Ph.D. programme after considering the additional course as an audit course which the candidate has passed.

The above is reported to the Senate.

Item No. 69.38: To report the action taken on the recommendation of ICC regarding continuation of Research Scholar C8 in the Ph.D. programme with a new supervisor.

On the recommendation of the 14th IRC, the Chairman Senate has approved the continuation of Research Scholar C8 in the Ph.D. programme with a new supervisor. The procedure of candidacy for Ph.D. may be started again in case there is any change in the research area.

The above is reported to the Senate.

Item No.69.39: To report the James Thomason Scholarship for JEE (Advanced) entrants with All India Rank (AIR) upto 300 and 500.

On the recommendation of a committee of DoAA, DoSW and Chairman, JEE (Advanced) 2017 the Chairman Senate has approved James Thomason Scholarship.

All students who take admission in IIT Roorkee through JEE (Advanced) and satisfy any one of the two eligibility conditions mentioned below will be provided **James Thomason Scholarship:-**

Eligibility:

1 A Student with All India Rank (AIR) up to 300.

2 The best ranked student joining in each department provided his/her All India Rank (AIR) is within 500.

Through James Thomason Scholarship the student will get Rs. 25000/- per month for his/her complete programme subject to securing a minimum of 8.00 CGPA every academic year. The financial management of the scholarship will be carried out by the Endowment Fund Management Committee. The scheme will be reviewed in May 2018.

The above is reported to the Senate.

Item No.69.40: To report the letter received from MHRD regarding improving the gender balance in the B.Tech. programmes of IITs.

The council of IITs in its 51st meeting held at IIT Bombay on 28.04.2017 approved the recommendations of a Sub-committee of JAB (Joint Admission Board) and decided to increase female enrolment in B.Tech. programmes of IITs from the current 8% to 14% in 2018-19, 17% in 2019-20 and 20% in 2020-2021 by creating supernumerary seats subject to the conditions listed in MHRD letter F.No. 24-9/2016-TS-I dated 13.07.2017, as given in **Appendix 'A'.**

The above is reported to the Senate.

F.No.24-9/2016-TS.I
Government of India
Ministry of Human Resource Development
Department of Higher Education
Technical Section – I

Shastri Bhawan, New Delhi
Dated, 13th July, 2017

Subject: Improving the gender balance in the B.Tech. Programmes of Indian Institutes of Technology (IITs)

With a view to improving gender balance in the B.Tech. programmes of Indian Institutes of Technology (IITs), the Joint Admission Board (JAB) in its meeting held on 21.08.2016, constituted a Sub Committee under the chairmanship of Dr. Timothy A. Gonsalves, Director, IIT Mandi to recommend remedial measures therefor.

2. The Committee, after having had deliberations in its meetings held on 13.12.2016 and 10.02.2017 as well as intense consultation with faculty members involved in the admission process in IITs, recommended a number of measures including, *inter-alia*, increasing female enrolment to 20% over a period of 2 - 4 years by creating supernumerary seats.

3. The Council of IITs chaired by the Hon'ble Minister of Human Resource Development, in its 51st meeting held at IIT Bombay on 28.04.2017 approved the recommendations and decided to increase female enrolment in B. Tech. programmes of IITs from the current 8% to 14% in 2018-19, 17% in 2019-20 and 20% in 2020-21 by creating supernumerary seats subject to the following conditions:-

(i) The number of male students admitted will not be reduced, unless the overall performance of male candidates in JEE (Advanced) declines vis-a-vis female candidates.

(ii) Any female candidate who would have got a seat prior to this scheme will get the same or a more preferred seat with this scheme.

(iii) Rank-based merit is strictly followed within the pool of male candidates and within the pool of female candidates.

(iv) Statutory reservation for Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Classes (OBCs) and for Physically Handicapped (PH)will be applicable in the supernumerary seats in the same manner as for the sanctioned seats.

(v) The Joint Implementation Committee OR the Joint Seat Allocation Authority will work out the business rules and detailed procedure for implementing the scheme.

Contd...2/-

4. This issues in consultation with the Ministry of Law & Justice, and with the approval of the Hon'ble Minister of Human Resource Development.

(Tripti Gurha)
Director (IITs)

Copy for necessary action to:

1. Chairman, Joint Admission Board, 2017
2. Chairman, Joint Admission Board, 2018
3. Directors, All IITs

Copy for information to:

1. PS to Hon'ble Minister of Human Resource Development
2. PS to Hon'ble Minister of State for Human Resource Development
3. Secretary, Department of Higher Education
4. Secretary, Department of School Education & Literacy
5. Additional Secretary (TE), Department of Higher Education

(Tripti Gurha)
Director (IITs)

Item No.69.41: To report the approved mode of evaluation of the course General Viva (EEN-310).

On the recommendation of the 55thIAPC the Chairman, Senate approved that the evaluation of the B.Tech. (Electrical Engineering) III year course No. EEN-310 (General Viva) be made under relative grading system.

The above is reported to the Senate.