

सीनेट की नवासीवीं बैठक का कार्यवृत्त

**MINUTES OF THE 89<sup>th</sup>  
MEETING OF THE SENATE**

09 दिसम्बर 2021  
09<sup>th</sup> DECEMBER 2021



भारतीय प्रौद्योगिकी संस्थान रुड़की  
रुड़की – 247 667 (भारत)  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**ROORKEE – 247 667 (INDIA)**

भारतीय प्रौद्योगिकी संस्थान रुड़की  
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| 89.17 | <p>डिजाइन विभाग के एमआईएम कार्यक्रम में प्रवेश के लिए पात्रता मानदंड में संशोधन पर विचार करना।</p> <p>To consider the revision in the eligibility criteria for admission to MIM programme of the Department of Design.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5 |
| 89.18 | <p>जल संसाधन विकास एवं प्रबंधन विभाग द्वारा "पीने के पानी और स्वच्छता" पर एम.टेक कार्यक्रम शुरू करने के साथ इसकी प्रस्तावित संरचना और प्रवेश प्रक्रिया के प्रस्ताव पर विचार करना।</p> <p>To consider the proposal of Department of Water Resource Development and Management to introduce M.Tech. programme on "Drinking Water and Sanitation" along with its proposed structure and admission process.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5 |
| 89.19 | <p>शैक्षणिक वर्ष 2022-2023 में यूजी कार्यक्रमों के लिए संशोधित सीट मैट्रिक्स पर विचार करना।</p> <p>To consider the revised seat matrix for UG programs in the academic year 2022-2023.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 |

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| 89.20                                             | अध्यक्ष, सीनेट द्वारा दी गई मंजूरी को रिपोर्ट करना।<br>To report the approvals accorded by the Chairman, Senate                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6     |
| अन्य मद के अन्तर्गत/ <b>Under any other items</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |
| 89.21                                             | सेन्टर ऑफ नैनोटेक्नोलोजी को सेन्टर फॉर नैनोटेक्नोलोजी के रूप में पुनःशब्दांकन करने के प्रस्ताव पर विचार करना।<br>To consider the proposal of rewording the Centre of Nanotechnology as Centre for Nanotechnology.                                                                                                                                                                                                                                                                                                                                                               | 6     |
| Annex-I                                           | दिनांक 09.12.2021 को उपस्थित सदस्यों की सूची।<br>List of present members on 09.12.2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 7-9   |
| App.-A-D                                          | बीएस-एमएस कार्यक्रमों की सामान्य संरचना और द्वितीय वर्ष के बाद के पाठ्यक्रम के लिए पर निम्नानुसार विचार करना:<br>1. बीएस-एमएस कार्यक्रमों के लिए सामान्य संरचना<br>2. (i) बीएस-एमएस (गणित और कंप्यूटिंग)<br>(ii) बीएस-एमएस (रासायनिक विज्ञान)<br>(iii) बीएस-एमएस (भौतिक)<br>The common structure for the BS-MS programmes and II year onwards curriculum as given below:<br>1. Common structure for BS-MS Programmes (Appendix-A)<br>2. (i) BS-MS (Mathematics and Computing) (Appendix-B)<br>(ii) BS-MS (Chemical Sciences) (Appendix-C)<br>(iii) BS-MS (Physics) (Appendix-D) | 10-36 |
| App.-E                                            | जल और नवीकरणीय ऊर्जा विभाग के मौजूदा एम.टेक प्रोग्राम का नाम 'वैकल्पिक जल ऊर्जा प्रणाली' से 'नवीकरणीय और जल ऊर्जा' बदलने और इसकी संरचना को संशोधित करने का प्रस्ताव।<br>The proposal of Department of Hydro and Renewable Energy to rename the existing M.Tech. program on 'Alternate Hydro Energy System' as "Renewable and Hydro Energy" and to revise its structure.                                                                                                                                                                                                         | 37-39 |
| App.-F                                            | यूजी नियमों के समान सहयोगी संस्थानों से मास्टर छात्रों के लिए क्रेडिट ट्रांसफर का प्रस्ताव।<br>The New Guidelines of credit transfer for Master students from partner institutes similar to UG regulation.                                                                                                                                                                                                                                                                                                                                                                      | 40    |
| App.-G                                            | एम-डेस (औद्योगिक डिजाइन) और एमआईएम (नवाचार प्रबंधन में परास्नातक) कार्यक्रम की संरचनाओं को संशोधित करने के डिजाइन विभाग का प्रस्ताव।<br>The proposal of Department of Design to revise the structures of M. Des. (Industrial Design) and MIM (Masters in Innovation Management) programs.                                                                                                                                                                                                                                                                                       | 41-50 |

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| App.-H | संस्थान भर के सभी संबंधित विभागों के लिए एमएससी से पीएचडी स्वीचओवर कार्यक्रम के लिए गठित समिति की संशोधित रिपोर्ट।<br>The revised report of the committee constituted for Switchover Programme from M.Sc. to Ph.D. for all the concerned Departments across the Institute. | 51    |
| App.-I | सत्र 2022-23 से एसएससी गणित की संशोधित संरचना लागू किये जाना।<br>The revised structure of M.Sc. Mathematics to be implemented from session 2022-23.                                                                                                                        | 52-56 |



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**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE  
MEETING SECTION**



**Minutes of the 89<sup>th</sup> Meeting of the Senate held on 09.12.2021 at  
04.00 P.M. in the Senate Hall.**

The list of participants who attended the meeting is appended at **Annexure-I.**

At the outset, the Chairman welcomed the members to the 89<sup>th</sup> meeting of the Senate. The Senate noted that today's meeting in physical mode is taking place after a gap of about two years.

The Chairman thanked and placed on record the valuable contributions of the following:

1. Prof. V.K. Agarwal, Chemical Engg. Department
2. Prof. (Mrs.) Bina Gupta, Chemistry Department
3. Prof. Akhilesh Gupta, Mech. & Ind. Engg. Department
4. Prof. P.K. Sahoo, Mech. & Ind. Engg. Department

The following members conveyed their inability to join the meeting:

1. Prof. R.K. Dutta, Chemistry Department
2. Prof. Krishnan Murugesan, Mech. & Ind. Engg. Deptt.
3. Prof. Ashwini Kumar Sharma, Biosciences and Bioengineering Department
4. Prof. Durga Toshniwal, Computer Science & Engg. Department.
5. Prof. K. R. Justin Thomas, Chemistry Department
6. Prof. Paritosh Mohanty, Chemistry Department
7. Prof. P. Arumugam, Physics Department
8. Prof. Priti Maheshwari, Department of Civil Engineering
9. Prof. Kaushik Pal, Mech. & Ind. Engg. Department
10. Prof. Rajat Agarwal, Department of Management & Studies
11. Prof. B. K. Patra, Physics Department
12. Prof. Mukesh Kumar Pathak, Electrical Engg. Department
13. Prof. Sanjeev Kumar, Head, Institute Computer Centre
14. Prof. Bhavesh Kumar Bhalja, ADOAA (Evaluation)
15. Prof. Anil K. Gourishetty, ADOSW (Students' Activities)

  
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The agenda was then taken up.

**Item No. 89.1: To confirm the minutes of the 88<sup>th</sup> Senate meeting held on 03.09.2021.**

The Senate confirmed the minutes as circulated on 12.10.2021.

**Item No.89.2: To report on the actions taken to implement the decisions of the Senate taken in its 88<sup>th</sup> meeting held on 03.09.2021.**

The Senate noted the actions taken on the minutes.

**Item No. 89.3 To consider the proposal of conducting the classes in offline (physical class-room) mode.**

The Senate considered and decided that the classes will continue with on-line mode of teaching until further review.

Further, wherever possible, the faculty members are encouraged to adopt hybrid mode of teaching in which students in the campus can join physically while others can join online.

**Item No. 89.4 To consider the common structure for the BS-MS programmes and II year onwards curriculum as given below:**

- 1. Common structure for BS-MS Programmes (Appendix-A)**
- 2. (i) BS-MS (Mathematics and Computing) (Appendix-B)**  
**(ii) BS-MS (Chemical Sciences) (Appendix-C)**  
**(iii) BS-MS (Physics) (Appendix-D)**

The Senate considered and approved a common framework for BS-MS programmes as given in **Appendix- A**.

The Senate also approved the following curricula:

- (a) BS-MS (Mathematics and Computing) and BS-MS (Chemical Sciences) – second year onwards **(Appendices B and C)**.
- (b) BS-MS (Physics) – second semester onwards **(Appendix-D)**.



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- Item No. 89.5** To consider the proposal of Department of Hydro and Renewable Energy to rename the existing M.Tech. program on 'Alternate Hydro Energy System' as "Renewable and Hydro Energy" and to revise its structure.

The Senate approved the proposal as given in **Appendix-E**.

- Item No. 89.6** To consider the proposal of credit transfer for Master students from partner institutes similar to UG regulation.

The Senate approved the guidelines for credit transfer of Masters students from partner institutions. The Senate further decided that the points at S. Nos. (7) & (8) be deleted from the corresponding existing provisions of credit transfer for UG students [Clause 35, UG Regulation].

The new guidelines for credit transfer of Undergraduate and Masters students are given in **Appendix-F**.

- Item No. 89.7** To consider the proposal of Department of Design to revise the structures of M. Des. (Industrial Design) and MIM (Masters in Innovation Management) programs.

The Senate considered the proposal and approved the revised structures as given in **Appendix-G**.

- Item No. 89.8** To consider the proposal to create second list in the admission to Ph. D. programme at the time of selection.

The Senate considered the proposal and decided to create category-wise Merit Lists of all qualified candidates, for each specialization, in a Department/Centre/School for admission to the Ph.D. programme.

- Item No. 89.9** To consider the Minimum Educational Qualification (MEQ) for admission in Ph. D. programme in Water Resources Development and Management Department.

The Senate considered the proposal and suggested IRC to reconsider the MEQ and it be subsequently placed before the Senate.

- Item No. 89.10** To report the approvals accorded by the Chairman, Senate.

The senate noted the items.

**Item No. 89.11 To consider the proposal of SAKUNTALA (Scheme for Aspirants of Knowledge Under Talent Advancement) Fellowship, a special scheme for female candidates for admission in Ph. D. programme at IIT Roorkee.**

The Senate considered and approved the proposal of **SAKUNTALA** Fellowship, with the following changes in the criteria:

1. **MEQ:** Any female candidate having B.Tech./B.E./B.Arch./B.Des. degree from CFTIs with CGPA  $\geq 8.5$  in the 10-point scale will be eligible for admission to the Ph.D. programme in the relevant disciplines. The requirement of GATE/CEED/ National Level examination will be waived off for such candidates.
2. **Selection:** The candidates will be selected through interview.
3. **Seats:** Seats in the above scheme will be supernumerary.
4. **Fellowship:** At par with the Institute Assistantship.

**Item No. 89.12 To consider the revised report of the committee constituted for Switchover Programme from M.Sc. to Ph.D. for all the concerned Departments across the Institute.**

The Senate considered and approved the proposal as given in **Appendix - H**.

**Item No. 89.13 To consider the proposal to offer an Open Elective Course to interested Masters and Ph.D. students as an AUDIT Course.**

The Senate approved the recommendation of the IAPC.

**Item No. 89.14 To consider the proposal regarding establishment of a virtual academic centre namely "Centre for Photonics and Quantum Communication Technology" (CPQCT).**

The Senate recommended the proposal for the establishment of an academic centre namely 'Centre for Photonics and Quantum Communication Technology' (CPQCT) to the Board of Governors for approval. The Senate further recommended that the Centre may function in virtual mode, to begin with.

**Item No. 89.15 To consider the following proposals of Department of Applied Science and Engineering:**

- 1. To rename the Department of Applied Science and Engineering as Department of Applied Mathematics and Scientific Computing.**
- 2. To introduce a M. Tech. Program in 'Applied Mathematics and Scientific Computing' along with its course structure and admission procedure.**

The Senate considered and approved the recommendation of the IAPC to rename the Department as Department of Applied Mathematics and Scientific Computing.

Further, the Senate approved the starting of an M. Tech. programme in Applied Mathematics and Scientific Computing. However, its course structure and admission procedure be reconsidered by IAPC. The revised course structure and admission procedure be placed before the Senate.

**Item No. 89.16 To consider the revised structure of M.Sc. Mathematics to be implemented from session 2022-23.**

The Senate approved the revised structure of M.Sc. Mathematics as given in **Appendix-I**, to be implemented from session 2022-23.

**Item No. 89.17 To consider the revision in the eligibility criteria for admission to MIM programme of the Department of Design.**

The Senate considered and approved the revised eligibility criteria for admission to the MIM programme of the Department of Design.

**Item No. 89.18 To consider the proposal of Department of Water Resource Development and Management to introduce M.Tech. programme on "Drinking Water and Sanitation" along with its proposed structure and admission process.**

The Senate approved the proposal to introduce an M.Tech. programme on 'Drinking Water and Sanitation'.

However, the Senate suggested that the curriculum of the programme be reconsidered by IAPC. The revised curriculum be placed before the Senate.

**Item No. 89.19 To consider the revised seat matrix for UG programs in the academic year 2022-2023.**

The Senate approved the following UG seat matrix for the academic year 2022-2023:

| S. No. | Discipline                        | Proposed (2022) |
|--------|-----------------------------------|-----------------|
| 1      | B.Tech. (Biosc. & Bioengg.)       | 46              |
| 2      | B.Tech. (Chemical)                | 117             |
| 3      | B.Tech. (Civil)                   | 174             |
| 4      | B.Tech. (CSE)                     | 109             |
| 5      | B.Tech. (Electrical Engg.)        | 165             |
| 6      | B.Tech. (E & CE)                  | 109             |
| 7      | B.Tech. (Engg. Physics)           | 50              |
| 8      | B.Tech. (Mechanical Engg.)        | 150             |
| 9      | B.Tech. (Met. & Mat. Engg.)       | 82              |
| 10     | B.Tech. (Prod.& Ind. Engg.)       | 58              |
| 11     | B.Arch.                           | 37              |
| 12     | Int. M.Tech. (GT)                 | 38              |
| 13     | Int. M.Tech. (GPT)                | 41              |
| 14     | BS-MS (Mathematics and Computing) | 42              |
| 15     | BS-MS (Chemical Sciences)         | 35              |
| 16     | BS-MS (Physics)                   | 27              |
| 17     | BS-MS (Economics)                 | 33              |
| 18     | B.Tech. (DS & AI)                 | 40              |
|        | Grand Total                       | <b>1353</b>     |

**Item No. 89.20 To report the approvals accorded by the Chairman, Senate.**

The senate noted the items.

**ANY OTHER ITEM**

**Item No.89.21 To consider the proposal of rewording the Centre of Nanotechnology as Centre for Nanotechnology.**

The Senate recommended the proposal to the Board of Governors for approval.

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

  
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## Annexure-I

Following were present:

|     |                                |                                   |
|-----|--------------------------------|-----------------------------------|
| 1.  | Prof. Ajit K. Chaturvedi       | Director & Chairman               |
| 2.  | Prof. M. Parida                | Deputy Director                   |
| 3.  | Prof. Milli Pant               | Applied Science & Engineering     |
| 4.  | Prof. Mahua Mukherjee          | Architecture & Planning           |
| 5.  | Prof. Pravindra Kumar          | Biotechnology                     |
| 6.  | Prof. Naveen Kumar Nawani      | Biotechnology                     |
| 7.  | Prof. Ranjana Pathania         | Biotechnology                     |
| 8.  | Prof. Gopinath Packirisamy     | Biotechnology                     |
| 9.  | Prof. Partha Roy               | Biotechnology                     |
| 10. | Prof. Prakash Biswas           | Chemical Engineering              |
| 11. | Prof. Amit Kumar Dhiman        | Chemical Engineering              |
| 12. | Prof. Prasenjit Mondal         | Chemical Engineering              |
| 13. | Prof. Vimal Chandra Srivastava | Chemical Engineering              |
| 14. | Prof. Naseem Ahmad             | Chemistry                         |
| 15. | Prof. Kaushik Ghosh            | Chemistry                         |
| 16. | Prof. M.R. Maurya              | Chemistry                         |
| 17. | Prof. Jeevanandam P.           | Chemistry                         |
| 18. | Prof. Muniappan Sankar         | Chemistry                         |
| 19. | Prof. Anuj Sharma              | Chemistry                         |
| 20. | Prof. U.P. Singh               | Chemistry                         |
| 21. | Prof. J.K. Ghosh               | Civil Engineering                 |
| 22. | Prof. S.K. Ghosh               | Civil Engineering                 |
| 23. | Prof. Bhola Ram Gurjar         | Civil Engineering                 |
| 24. | Prof. M.A. Iqbal               | Civil Engineering                 |
| 25. | Prof. Kamal Jain               | Civil Engineering                 |
| 26. | Prof. Praveen Kumar            | Civil Engineering                 |
| 27. | Prof. Satyendra Mittal         | Civil Engineering                 |
| 28. | Prof. C.S.P. Ojha              | Civil Engineering                 |
| 29. | Prof. Manoranjan Parida        | Civil Engineering                 |
| 30. | Prof. K.S. Hari Prasad         | Civil Engineering                 |
| 31. | Prof. Rajat Rastogi            | Civil Engineering                 |
| 32. | Prof. N.K. Samadhiya           | Civil Engineering                 |
| 33. | Prof. Vishwas Sawant           | Civil Engineering                 |
| 34. | Prof. Mahendra Singh           | Civil Engineering                 |
| 35. | Prof. R. Balasubramanian       | Computer Science & Engineering    |
| 36. | Prof. Rajdeep Niyogi           | Computer Science & Engineering    |
| 37. | Prof. Pankaj Agrawal           | Earthquake Engineering            |
| 38. | Prof. Bal Krishna Maheshwari   | Earthquake Engineering            |
| 39. | Prof. Manish Shrikhande        | Earthquake Engineering            |
| 40. | Prof. N.P. Padhy               | Electrical Engineering            |
| 41. | Prof. G.N. Pillai              | Electrical Engineering            |
| 42. | Prof. P. Sumathi               | Electrical Engineering            |
| 43. | Prof. Anand Bulusu             | Electronics & Communication Engg. |
| 44. | Prof. Sudeb Dasgupta           | Electronics & Communication Engg. |



|     |                                   |                                   |
|-----|-----------------------------------|-----------------------------------|
| 45. | Prof. Sanjeev Manhas              | Electronics & Communication Engg. |
| 46. | Prof. N.P. Pathak                 | Electronics & Communication Engg. |
| 47. | Prof. Amalendu Patnaik            | Electronics & Communication Engg. |
| 48. | Prof. Dharmendra Singh            | Electronics & Communication Engg. |
| 49. | Prof. (Mrs.) Smita Jha            | Humanities & Social Sciences      |
| 50. | Prof. Nagendra Kumar              | Humanities & Social Sciences      |
| 51. | Prof. Anindya Jayanta Mishra      | Humanities & Social Sciences      |
| 52. | Prof. D.S. Arya                   | Hydrology                         |
| 53. | Prof. N.K. Goel                   | Hydrology                         |
| 54. | Prof. M.K. Jain                   | Hydrology                         |
| 55. | Prof. Himanshu Joshi              | Hydrology                         |
| 56. | Prof. Brijesh Kumar Yadav         | Hydrology                         |
| 57. | Prof. Arun Kumar                  | Hydro & Renewable Energy          |
| 58. | Prof. R.P. Saini                  | Hydro & Renewable Energy          |
| 59. | Prof. Sunil Kumar Singhal         | Hydro & Renewable Energy          |
| 60. | Prof. Ramesh Chandra              | Institute Instrumentation Centre  |
| 61. | Prof. M.K. Barua                  | Management Studies                |
| 62. | Prof. (Mrs.) Usha Lenka           | Management Studies                |
| 63. | Prof. Vinay Sharma                | Management Studies                |
| 64. | Prof. Sandip Banerjee             | Mathematics                       |
| 65. | Prof. Premananda Bera             | Mathematics                       |
| 66. | Prof. Kusum Deep                  | Mathematics                       |
| 67. | Prof. N. Sukavanam                | Mathematics                       |
| 68. | Prof. A. Swaminathan              | Mathematics                       |
| 69. | Prof. Navneet Arora               | Mechanical & Industrial Engg.     |
| 70. | Prof. Sushanta Dutta              | Mechanical & Industrial Engg.     |
| 71. | Prof. Akshay Dvivedi              | Mechanical & Industrial Engg.     |
| 72. | Prof. B.K. Gandhi                 | Mechanical & Industrial Engg.     |
| 73. | Prof. P.K. Jha                    | Mechanical & Industrial Engg.     |
| 74. | Prof. Manish Mishra               | Mechanical & Industrial Engg.     |
| 75. | Prof. P.M. Pathak                 | Mechanical & Industrial Engg.     |
| 76. | Prof. Apurbba Kumar Sharma        | Mechanical & Industrial Engg.     |
| 77. | Prof. Inderdeep Singh             | Mechanical & Industrial Engg.     |
| 78. | Prof. K.M. Singh                  | Mechanical & Industrial Engg.     |
| 79. | Prof. Andallib Tariq              | Mechanical & Industrial Engg.     |
| 80. | Prof. S.H. Upadhyay               | Mechanical & Industrial Engg.     |
| 81. | Prof. Gajanan Prabhakar Chaudhuri | Metallurgical & Materials Engg.   |
| 82. | Prof. B.V.M. Kumar                | Metallurgical & Materials Engg.   |
| 83. | Prof. Anjan Sil                   | Metallurgical & Materials Engg.   |
| 84. | Prof. Dharam Dutt                 | Paper Technology                  |
| 85. | Prof. Ajay                        | Physics                           |
| 86. | Prof. Rajdeep Chatterjee          | Physics                           |
| 87. | Prof. Aalok Misra                 | Physics                           |
| 88. | Prof. Vipul Rastogi               | Physics                           |
| 89. | Prof. Ghanshyam Das Varma         | Physics                           |
| 90. | Prof. Davinder Kaur Walia         | Physics                           |
| 91. | Prof. Ajay Wasan                  | Physics                           |
| 92. | Prof. Kanhaiya Lal Yadav          | Physics                           |
| 93. | Prof. Sujay Chattopadhyay         | Polymer & Process Engineering     |

94. Prof. Y.S. Negi Polymer & Process Engineering  
95. Prof. M.L. Kansal WRD&M  
96. Prof. Deepak Khare WRD&M  
97. Prof. S.K. Mishra WRD&M  
98. Prof. Ashish Pandey WRD&M  
99. Prof. Sumit Sen, Head, Centre of Excellence in Disaster Miti. and Management  
100. Prof. C.N. Ramchandran, Associate Dean of Academic Affairs (Curriculum)  
101. Prof. Kiran Ambatipudi, Associate Dean of Students' Welfare (Student Wellness)  
102. Dr. C. Jayakumar, Librarian  
103. Prof. Dheeraj K. Khatod, Chairman, SCSP  
  
104. Mr. Prashant Garg Secretary



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**Credits for BS-MS Programs**

| <b>CURRICULAR COMPONENTS</b>                                                                                 | <b>Credits</b> |
|--------------------------------------------------------------------------------------------------------------|----------------|
| <b>(a) Institute Core Courses</b>                                                                            |                |
| (i) Humanities and Social Sciences (HSSC)                                                                    | 04             |
| (ii) Basic Sciences (BSC)                                                                                    | 16-20          |
| (iii) Engineering Science (ESC)                                                                              | 08-16          |
| (iv) General Sciences (GSC)                                                                                  | 03             |
| <b>Total</b>                                                                                                 | <b>31-43</b>   |
| <b>(b) Program Core Courses (PCC)</b>                                                                        |                |
| i. Class Contact Core courses                                                                                | 92-102         |
| ii. Introduction to (Discipline) Engineering/Sciences                                                        | 02             |
| iii. Technical Communication                                                                                 | 02             |
| iv. Project/Thesis                                                                                           | 12-16          |
| v. Seminar                                                                                                   | 0-2            |
| vi. Educational Industrial Tour                                                                              | S/U            |
| vii. Internship                                                                                              | 0-2            |
| <b>Total</b>                                                                                                 | <b>108-126</b> |
| <b>(c) Humanities, Social Sciences and Management Elective Courses (HSSMEC)</b>                              |                |
| i. Humanities and Social Sciences                                                                            | 03             |
| ii. Management Studies                                                                                       | 03             |
| <b>Total</b>                                                                                                 | <b>06</b>      |
| <b>(d) Open Elective Course (OEC)</b>                                                                        | <b>03-06</b>   |
| <b>(e) Programme Elective Courses (PEC)</b>                                                                  | <b>24-32</b>   |
| <b>(f) Minor Specialisation Courses (MSC)/Departmental Honour Courses (DHC)</b>                              | <b>18-20</b>   |
| <b>(g) Co-curricular Activities (CCA)</b>                                                                    |                |
| i. Discipline (To be awarded after Final Year)                                                               | 02             |
| ii. NCC/NSO/NSS (First Year)*                                                                                | -              |
| <b>Total</b>                                                                                                 | <b>02</b>      |
| <b>Grand Total</b><br>(For those who exit after BS program)                                                  | <b>156-168</b> |
| <b>Grand Total</b><br>(For those who opt for degree with minor specialisation or honours with BS program)    | <b>174-188</b> |
| <b>Grand Total</b><br>(For those who opt BS-MS program)                                                      | <b>186-198</b> |
| <b>Grand Total</b><br>(For those who opt for degree with minor specialisation or honours with BS-MS program) | <b>204-218</b> |

\* The students opting for these proficiencies at first year level will be given the certificate by the office of Dean of Students' Welfare with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

  
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**Credit distribution in proposed BS- MS (Mathematics and Computing) Program**

| CURRICULAR COMPONENTS                                                          | CREDITS        | REMARK                                                                                                                         |
|--------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>(a) Institute Core Courses</b>                                              |                |                                                                                                                                |
| (i) Humanities and Social Sciences (HSSC)                                      | 04             | *From Mathematics Department<br>** From other departments                                                                      |
| (ii) Basic Sciences (BSC)                                                      | 16 (4** +12*)  |                                                                                                                                |
| (iii) Engineering Sciences (ESC)                                               | 08**           |                                                                                                                                |
| (iv) General Sciences (GSC)                                                    | 03             |                                                                                                                                |
| Total =                                                                        | 31             |                                                                                                                                |
| <b>(b) Programme Core Courses (PCC)</b>                                        |                |                                                                                                                                |
| (i) Class Contact Core Courses                                                 | 92             | * 4 Credits for Stage 1 and 12 Credits for Stage 2                                                                             |
| (ii) Introduction to (discipline)Eng./Science                                  | 02             |                                                                                                                                |
| (iii) Technical Communication                                                  | 02             |                                                                                                                                |
| (iv) Project/Thesis                                                            | 16 (4 +12) *   |                                                                                                                                |
| (v) Seminar                                                                    | -              |                                                                                                                                |
| (vi) Educational Tour                                                          | -              |                                                                                                                                |
| Total =                                                                        | 112            |                                                                                                                                |
| <b>(c) Humanities, Social Science and Management Elective Courses (HSSMEC)</b> |                |                                                                                                                                |
| (i) Humanities & Social Science                                                | 03             |                                                                                                                                |
| (ii) Management Studies                                                        | 03             |                                                                                                                                |
| Total =                                                                        | 06             |                                                                                                                                |
| <b>(d) Open Elective Course (OEC)</b>                                          | 03-06          |                                                                                                                                |
| <b>(e) Program Elective Courses (PEC)</b>                                      | 32             |                                                                                                                                |
| <b>(f) Co-curricular Activities (CCA)</b>                                      |                |                                                                                                                                |
| (i) Discipline (To be awarded after Final Year)                                | 02             |                                                                                                                                |
| (ii) NCC/NSO/NSS (First Year)*                                                 | -              |                                                                                                                                |
| Total =                                                                        | 02             |                                                                                                                                |
| <b>Grand Total (a+b+c+d+e+f) =</b>                                             | <b>186-189</b> | <b>158-161 Credits for BS degree<br/>176-181 Credits for BS degree with MSC)<br/>204-209 Credits for BS-MS degree with MSC</b> |

\*The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

  
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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS

**Teaching Scheme**

| Year                                                | Credits in Autumn Semester                  | Credits in Spring Semester | Credits (year-wise)                               |
|-----------------------------------------------------|---------------------------------------------|----------------------------|---------------------------------------------------|
| 1                                                   | 21                                          | 20                         | 41                                                |
| 2                                                   | 20                                          | 21                         | 41                                                |
| 3                                                   | 19-22                                       | 16-19                      | 38-41                                             |
| 4                                                   | 16                                          | 20                         | 36                                                |
| 5                                                   | 16                                          | 12                         | 28                                                |
| Extra-Curricular                                    |                                             |                            | 02                                                |
| Grand Total                                         | 92-95                                       | 89-92                      | 186-189 for BS-MS degree<br>158-161 for BS degree |
| Grand Total with<br>Minor Specialization<br>Courses | 5 more course with additional credits 18-20 |                            | 204-209 for BS-MS degree<br>176-181 for BS degree |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS  
 Year : I

| 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 |
| <b>Autumn Semester</b> |              |                                       |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MAN-001      | Mathematics-1                         | BSC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PHN-001      | Mechanics                             | BSC          | 4         | 3                  | 0        | 2        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | CEN-105      | Introduction to Environmental Studies | GSC          | 3         | 3                  | 0        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | HSN-001      | Communication Skills                  | HSSC         | 2         | 1                  | 0        | 2        | 2                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | HSN-002      | Introduction to Psychology            | HSSC         | 2         | 1                  | 1        | 0        | 2                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | MA-101       | Introduction to Mathematical Sciences | PCC          | 2         | 2                  | 0        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.                     | MA-103       | Introduction to Computer Programming  | PCC          | 4         | 3                  | 0        | 2        | 3                    | 0         | 10-25               | 25  | 15-25 | 30-40 | -   |
| <b>Total</b>           |              |                                       |              | <b>21</b> | <b>17</b>          | <b>2</b> | <b>6</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                       |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MAN-004      | Numerical Methods                     | BSC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | MAN-006      | Probability and Statistics            | BSC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | MA-102       | Elementary Real Analysis              | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-104       | Number Theory                         | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | CSN-102      | Data Structures                       | ESC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                                       |              | <b>20</b> | <b>15</b>          | <b>5</b> | <b>0</b> |                      |           |                     |     |       |       |     |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

1

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS  
 Year : II

| 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 |
| <b>Autumn Semester</b> |              |                                             |              |           |                    |            |          |                      |           |                     |     |       |       |     |
| 1.                     | MA-201       | Basic Abstract Algebra                      | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | MA-203       | Design and Analysis of Algorithms           | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | MA-205       | Discrete Mathematics                        | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-207       | Linear Algebra                              | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | MA-209       | Ordinary and Partial Differential Equations | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                                             |              | <b>20</b> | <b>15</b>          | <b>4/5</b> | <b>0</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                             |              |           |                    |            |          |                      |           |                     |     |       |       |     |
| 1.                     | MA-202       | Complex Analysis                            | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | MA-204       | Statistical Machine Learning                | PCC          | 4         | 3                  | 0          | 2        | 3                    | 0         | 10-25               | 25  | 15-25 | 30-40 | -   |
| 3.                     | MA-206       | Stochastic Calculus                         | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-208       | Technical Communication                     | PCC          | 2         |                    |            |          |                      |           | 100                 |     |       |       |     |
| 5.                     | MA-210       | Transform Techniques                        | PCC          | 4         | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | HSS-ELE      | HSS Elective Course                         | HSSMEC       | 3         | 3                  | 0          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                                             |              | <b>21</b> | <b>17</b>          | <b>4</b>   | <b>0</b> |                      |           |                     |     |       |       |     |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS  
 Year : III

| 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 |
| <b>Autumn Semester</b> |              |                                      |              |              |                    |            |          |                      |           |                     |     |       |       |     |
| 1.                     | CSN-351      | Database Management System           | ESC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | MA-301       | Fluid Dynamics                       | PCC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | MA-303       | Numerical Analysis                   | PCC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-305       | Operations Research                  | PCC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | MS-ELE       | Management Elective Course           | HSSMEC       | 3            | 3                  | 0          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | *OEC-1       | Institute Open Elective              | OEC          | 3            | 3                  | 0          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                                      |              | <b>19-22</b> | <b>15</b>          | <b>4</b>   | <b>0</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                      |              |              |                    |            |          |                      |           |                     |     |       |       |     |
| 1.                     | MA-302       | Mathematical Modeling and Simulation | PCC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | MA-304       | Theory of Computation                | PCC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | MA-ELE       | Program Elective – 1                 | PEC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-ELE       | Program Elective – 2                 | PEC          | 4            | 3                  | 1          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | *OEC-2       | Institute Open Elective              | OEC          | 3            | 3                  | 0          | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | MSC-1        | Minor Specialization Course-1        | MSC          | 3/4          | 3                  | 0/1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                                      |              | <b>16-23</b> | <b>18</b>          | <b>4/5</b> | <b>0</b> |                      |           |                     |     |       |       |     |

\*Students can take one or both courses under OEC category.

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS  
 Year : IV

| 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.                                                                                                                                      | MA-401       | Abstract Algebra                          | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 2.                                                                                                                                      | MA-409       | Real Analysis                             | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 3.                                                                                                                                      | MA-411       | Theory of Ordinary Differential Equations | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 4.                                                                                                                                      | MA-ELE       | Program Elective-3                        | PEC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 5.                                                                                                                                      | MSC-2        | Minor Specialization Course-2             | MSC              | 3/4     | 3                  | 0/1 | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 6.                                                                                                                                      | MSC-3        | Minor Specialization Course-3             | MSC              | 3/4     | 3                  | 0/1 | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| Total                                                                                                                                   |              |                                           |                  | 16-24   | 12/18              | 4/6 | 0 |                      |           |                     |       |       |       |       |       |
| Spring Semester                                                                                                                         |              |                                           |                  |         |                    |     |   |                      |           |                     |       |       |       |       |       |
| 1.                                                                                                                                      | MAN-404      | Functional Analysis                       | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 2.                                                                                                                                      | MAN-408      | Theory of Partial Differential Equations  | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 3.                                                                                                                                      | MAN-410      | Topology                                  | PCC              | 4       | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 4.                                                                                                                                      | MA-ELE       | Program Elective -4                       | MAN-400 Project* | PEC     | 4                  | 3   | 1 | 0                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | 20-35 |
| 5.                                                                                                                                      | MA-ELE       | Program Elective -5                       |                  | PEC     | 4                  | 3   | 1 | 0                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | 20-35 |
| 6.                                                                                                                                      | MSC-4        | Minor Specialization Course-4             | MSC              | 3/4     | 3                  | 0/1 | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| 7.                                                                                                                                      | MSC-5        | Minor Specialization Course-5             | MSC              | 3/4     | 3                  | 0/1 | 0 | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | 20-35 |       |
| Total                                                                                                                                   |              |                                           |                  | 20-28   | 15/21              | 5/7 | 0 |                      |           |                     |       |       |       |       |       |
| *Students can take either Department Electives 4 and 5 or Project to complete 8 credits under PEC category in 8 <sup>th</sup> Semester. |              |                                           |                  |         |                    |     |   |                      |           |                     |       |       |       |       |       |

\*Students can take either Department Electives 4 and 5 or Project to complete 8 credits under PEC category in 8<sup>th</sup> Semester.

**NOTE:** The students wishing to exit the program with BS degree must inform the Department/Institute before subject registration for 5<sup>th</sup> Year.



**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

Program Code : 312 BS-MS (Mathematics and Computing)  
 Department : MA MATHEMATICS  
 Year : V

| 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 |
| <b>Autumn Semester</b> |              |                      |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MAN-500A     | Thesis Stage-1       | PCC          | 4         | 0                  | 0        | 0        | 0                    | 0         | -                   | -   | 30    | 70    | -   |
| 2.                     | MA-ELE       | Program Elective - 6 | PEC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | MA-ELE       | Program Elective - 7 | PEC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | MA-ELE       | Program Elective - 8 | PEC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>           |              |                      |              | <b>16</b> | <b>9</b>           | <b>3</b> | <b>0</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                      |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MAN-500B     | Thesis Stage-2       | PCC          | 12        | 0                  | 0        | 0        | 0                    | 0         | -                   | -   | 30    | 70    | -   |
| <b>Total</b>           |              |                      |              | <b>12</b> | <b>0</b>           | <b>0</b> | <b>0</b> |                      |           |                     |     |       |       |     |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

**List of the Program Elective Courses**

Program Code : 312 BS-MS in Mathematics and Computing  
 Department : MA MATHEMATICS

| 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 |
| <b>Program Elective Courses (Elective-1 and Elective-2) to be chosen in Third Year</b>        |              |                                         |              |         |                    |   |   |                      |           |                     |     |       |       |     |
| 1.                                                                                            | MA-411       | Analytic Number Theory                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                                                                                            | MA-412       | Combinatorial Mathematics               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                                                                                            | MA-413       | Credit Risk Management                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                                                                                            | MA-414       | Differential Geometry                   | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                                                                                            | MA-415       | Financial Risk Management               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                                                                                            | MA-416       | Graph Theory                            | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.                                                                                            | MA-417       | Mathematical Image Processing           | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 8.                                                                                            | MA-418       | Numerical Optimization                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Program Elective Courses (Elective-3 to Elective-8) to be chosen in IV Year and V Year</b> |              |                                         |              |         |                    |   |   |                      |           |                     |     |       |       |     |
| 1.                                                                                            | MA-400       | Project                                 | PEC          | 8       | 0                  | 0 | 0 | 0                    | 0         | -                   | -   | 30    | 70    | -   |
| 2.                                                                                            | MA-511       | Abstract Harmonic Analysis              | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                                                                                            | MA-512       | Advanced Complex Analysis               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                                                                                            | MA-513       | Advanced Matrix Theory                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                                                                                            | MA-514       | Advanced Numerical Analysis             | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                                                                                            | MA-515       | Advanced Operations Research            | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.                                                                                            | MA-516       | Advanced Partial Differential Equations | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 8.                                                                                            | MA-517       | Algebraic Number Theory                 | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 9.                                                                                            | MA-518       | Algebraic Topology                      | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 10.                                                                                           | MA-519       | Approximation Theory                    | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Structure (To be implemented from the session 2021-2022)**

|     |        |                                               |     |   |   |   |   |   |   |       |   |       |       |   |
|-----|--------|-----------------------------------------------|-----|---|---|---|---|---|---|-------|---|-------|-------|---|
| 11. | MA-520 | Coding Theory                                 | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 12. | MA-521 | Commutative Algebra                           | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 13. | MA-522 | Computational Fluid Dynamics                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 14. | MA-523 | Control Theory                                | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 15. | MA-524 | Dynamical Systems                             | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 16. | MA-525 | Financial Mathematics                         | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 17. | MA-526 | Finite Element Methods                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 18. | MA-527 | Fuzzy Sets and Fuzzy Systems                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 19. | MA-528 | Hyperbolic Conservation Laws                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 20. | MA-529 | Integral Equations and Calculus of Variations | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 21. | MA-530 | Machine Learning in Finance                   | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 22. | MA-531 | Mathematical Biology                          | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 23. | MA-532 | Mathematical Cryptography                     | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 24. | MA-533 | Measure Theory                                | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 25. | MA-534 | Multivariate Techniques                       | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 26. | MA-535 | Numerical Linear Algebra                      | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 27. | MA-536 | Operator Theory                               | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 28. | MA-537 | Optimal Control Theory                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 29. | MA-538 | Orthogonal Polynomials and Special Functions  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 30. | MA-539 | Portfolio Optimization                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 31. | MA-540 | Regularization Theory for Inverse Problems    | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 32. | MA-541 | Representation Theory of Finite Groups        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 33. | MA-542 | Semigroup Theory and Applications             | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 34. | MA-543 | Sobolev Spaces and Applications               | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 35. | MA-544 | Statistical Inference                         | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 36. | MA-545 | Stochastic Differential Equations             | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 37. | MA-546 | Stochastic Partial Differential Equations     | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 38. | MA-547 | Wavelet Analysis                              | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |

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**Proposal for BS-MS in Chemical Sciences  
(4+1 Year Dual Degree Programme)**

**Program Overview**

Chemistry Department proposes to replace the existing 5-year integrated M.Sc. in Chemistry by (4+1) year BS-MS Dual Degree in Chemical Sciences with an exit option to earn BS degree after successful completion of 4 years.

**Program Salient Features**

**Exit option:** The students willing to exit the program with BS degree can apply before the end of 7<sup>th</sup> semester.

**For BS Degree:** All the essential fundamentals will be covered including sufficient practical exposure up to 8<sup>th</sup> semester. Students will gain fundamental knowledge on all the specializations (analytical, physical, inorganic, organic, materials, computational & theoretical chemistry) and a research project. The students qualifying with BS degree will have career prospects in chemical industry and for higher studies.

**For MS Degree:** 5<sup>th</sup> Year will be extensively research-oriented with dissertation work and advanced elective courses. Students continuing and completing 5 years of study will obtain dual degree (BS-MS in Chemical Sciences). Students will gain advanced knowledge and research exposure. The qualifying students will have prospects for higher studies and eligibility for scientists posts in scientific and industrial laboratories.

  
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**DEPARTMENT OF CHEMISTRY**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS (Chemical Sciences)**  
Department: **CY Chemistry**

**Teaching Scheme**

| Year                                       | Credits in Autumn Semester    | Credits in Spring Semester | Credits (Year-wise)                               |
|--------------------------------------------|-------------------------------|----------------------------|---------------------------------------------------|
| 1                                          | 21                            | 23                         | 44                                                |
| 2                                          | 23                            | 24                         | 47                                                |
| 3                                          | 21                            | 19                         | 40                                                |
| 4                                          | 16                            | 17                         | 33                                                |
| 5                                          | 15                            | 12                         | 27                                                |
| Co-curricular Activities                   |                               |                            | 02                                                |
| Grand Total                                | 96                            | 95                         | 193 for BS-MS Degree<br>166 for BS Degree         |
| Total with Minor<br>Specialization Courses | with additional 18-20 credits |                            | 211-213 for BS-MS Degree<br>184-186 for BS Degree |

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### Credit Distribution for BS-MS Programme in Chemical Sciences

| Curricular Components                                                          | Credit Distribution for<br>for BS-MS (Chemical Sciences) |
|--------------------------------------------------------------------------------|----------------------------------------------------------|
| <b>(a) Institute Core Courses</b>                                              |                                                          |
| Humanities and Social Sciences (HSSC)                                          | 04                                                       |
| Basic Sciences (BSC)                                                           | 20                                                       |
| Engineering Sciences (ESC)                                                     | 12                                                       |
| General Sciences (GSC)                                                         | 03                                                       |
| <b>Total</b>                                                                   | <b>39</b>                                                |
| <b>(b) Program Elective Courses (PCC)</b>                                      |                                                          |
| Class Contact Core Courses                                                     | 95                                                       |
| Introduction to discipline                                                     | 02                                                       |
| Technical Communication                                                        | 02                                                       |
| Project/Dissertation                                                           | 16                                                       |
| Seminar                                                                        | 02                                                       |
| Educational Tour                                                               | S/U <sup>#</sup>                                         |
| <b>Total</b>                                                                   | <b>117</b>                                               |
| <b>(c) Humanities, Social Science and Management Elective Courses (HSSMEC)</b> |                                                          |
| Humanities & Social Science                                                    | 03                                                       |
| Management Studies                                                             | 03                                                       |
| <b>Total</b>                                                                   | <b>06</b>                                                |
| <b>(d) Open Elective Courses (OEC) Total</b>                                   | <b>03</b>                                                |
| <b>(e) Program Elective Courses (PEC) Total</b>                                | <b>26</b>                                                |
| <b>(f) Co-curricular Activities</b>                                            |                                                          |
| Discipline (to be awarded after final year)                                    | 02                                                       |
| NCC/NSO/NSS (First year)*                                                      | -                                                        |
| <b>Grand Total</b>                                                             | <b>193</b>                                               |

<sup>#</sup>S/U refers Satisfactory/Unsatisfactory

\* The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

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**DEPARTMENT OF CHEMISTRY**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS (Chemical Sciences)**  
Department: **CY Chemistry**  
Year: **I**

| Teaching Scheme             |          |                                       |           |           | Contact Hours/Week |   |   | Exam. Duration |           | Relative Weight (%) |     |       |       |     |
|-----------------------------|----------|---------------------------------------|-----------|-----------|--------------------|---|---|----------------|-----------|---------------------|-----|-------|-------|-----|
| S. No.                      | Sub Code | Courses Title                         | Sub. Area | Credits   | L                  | T | P | Theory         | Practical | CWS                 | PRS | MTE   | ETE   | PRE |
| <b>Semester-I (Autumn)</b>  |          |                                       |           |           |                    |   |   |                |           |                     |     |       |       |     |
| 1.                          | MA-001   | Mathematics-I                         | BSC       | 4         | 3                  | 1 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 2.                          | CY-101   | Introduction to Chemical Science      | PCC       | 2         | 2                  | 0 | 0 | 0              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 3.                          | CY-103   | Computer Programming                  | ESC       | 4         | 3                  | 0 | 2 | 3              | 0         | 10-25               | 25  | 15-25 | 30-40 | 0   |
| 4.                          | PH-007   | Modern Physics                        | BSC       | 4         | 3                  | 0 | 2 | 3              | 0         | 10-25               | 25  | 15-25 | 30-40 | 0   |
| 5.                          | HSN-002  | Introduction to Psychology            | HSSC      | 2         | 1                  | 1 | 0 | 2              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 6.                          | CEN-105  | Introduction to Environmental Studies | GSC       | 3         | 3                  | 0 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 7.                          | HSN-001  | Communication Skills                  | HSSC      | 2         | 1                  | 0 | 2 | 2              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
|                             |          | <b>Total</b>                          |           | <b>21</b> |                    |   |   |                |           |                     |     |       |       |     |
| <b>Semester-II (Spring)</b> |          |                                       |           |           |                    |   |   |                |           |                     |     |       |       |     |
| 1.                          | MA-004   | Numerical Methods                     | BSC       | 4         | 3                  | 1 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 2.                          | PH-008   | Electromagnetic theory                | BSC       | 4         | 3                  | 1 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 3.                          | CY-102   | Physical Chemistry-I                  | PCC       | 4         | 3                  | 0 | 2 | 3              | 2         | 10-25               | 25  | 15-25 | 30-40 | 0   |
| 4.                          | CY-104   | Organic and Inorganic Chemistry       | PCC       | 4         | 3                  | 0 | 2 | 3              | 2         | 10-25               | 25  | 15-25 | 30-40 | 0   |
| 5.                          | CY-106   | Basic Analytical Chemistry            | PCC       | 3         | 3                  | 0 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 6.                          | CHN-102  | Energy Engineering                    | ESC       | 4         | 3                  | 1 | 0 | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
|                             |          | <b>Total</b>                          |           | <b>23</b> |                    |   |   |                |           |                     |     |       |       |     |

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PH



Program Code: **XX BS-MS (Chemical Sciences)**  
 Department: **CY Chemistry**  
 Year: **II**

| Teaching Scheme              |          |                                             |           |           | Contact Hours/Week |   |    | Exam. Duration |           | Relative Weight (%) |       |       |       |       |
|------------------------------|----------|---------------------------------------------|-----------|-----------|--------------------|---|----|----------------|-----------|---------------------|-------|-------|-------|-------|
| S. No.                       | Sub Code | Courses Title                               | Sub. Area | Credits   | L                  | T | P  | Theory         | Practical | CWS                 | PRS   | MTE   | ETE   | PRE   |
| <b>Semester-III (Autumn)</b> |          |                                             |           |           |                    |   |    |                |           |                     |       |       |       |       |
| 1.                           | BT-201   | Genetics and Developmental Biology          | ESC       | 4         | 3                  | 0 | 2  | 3              | 0         | 10-25               | 25    | 15-25 | 30-40 | 0     |
| 2.                           | CY-201   | Chemical Thermodynamics                     | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 3.                           | CY-203   | Main Group and Cluster Chemistry            | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 4.                           | CY-205   | Organic Chemistry-I                         | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 5.                           | MA-209   | Ordinary and Partial Differential Equations | BSC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 6.                           | HSS-ELE  | HSS Elective Course                         | HSSMEC    | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
|                              |          | <b>Total</b>                                |           | <b>23</b> |                    |   |    |                |           |                     |       |       |       |       |
| <b>Semester-IV (Spring)</b>  |          |                                             |           |           |                    |   |    |                |           |                     |       |       |       |       |
| 1.                           | CY-202   | Coordination Chemistry and Organometallics  | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 2.                           | CY-204   | Organic Chemistry-II                        | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 3.                           | CY-206   | Chemical Kinetics                           | PCC       | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 4.                           | CY-208   | Polymer Chemistry                           | PCC       | 4         | 3                  | 1 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 5.                           | CY-212   | Laboratory-I                                | PCC       | 6         | 0                  | 0 | 12 | 0              | 4         | 0                   | 25-35 | 20-30 | 0     | 40-50 |
| 6.                           | CY-ELE1  | Program Elective-1                          | PEC       | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
|                              |          | <b>Total</b>                                |           | <b>24</b> |                    |   |    |                |           |                     |       |       |       |       |

Program Code: **XX BS-MS (Chemical Sciences)**  
 Department: **CY Chemistry**  
 Year: **III**

| Teaching Scheme             |          |                                        |           |              | Contact Hours/Week |     |   | Exam. Duration |           | Relative Weight (%) |       |       |       |       |
|-----------------------------|----------|----------------------------------------|-----------|--------------|--------------------|-----|---|----------------|-----------|---------------------|-------|-------|-------|-------|
| S. No.                      | Sub Code | Courses Title                          | Sub. Area | Credits      | L                  | T   | P | Theory         | Practical | CWS                 | PRS   | MTE   | ETE   | PRE   |
| <b>Semester-V (Autumn)</b>  |          |                                        |           |              |                    |     |   |                |           |                     |       |       |       |       |
| 1.                          | CY-301   | Quantum Chemistry and Chemical Bonding | PCC       | 4            | 3                  | 1   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 2.                          | CY-303   | Advanced Coordination Chemistry        | PCC       | 4            | 3                  | 1   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 3.                          | CY-305   | Organic Chemistry-III                  | PCC       | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 4.                          | CY-311   | Organic Chemistry Laboratory           | PCC       | 4            | 0                  | 0   | 8 | 0              | 4         | 0                   | 25-35 | 20-30 | 0     | 40-50 |
| 5.                          | OEC-1    | Open Elective Course-1                 | OEC       | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 6.                          | CY-ELE2  | Program Elective-2                     | PEC       | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
|                             |          | <b>Total</b>                           |           | <b>21</b>    |                    |     |   |                |           |                     |       |       |       |       |
| <b>Semester-VI (Spring)</b> |          |                                        |           |              |                    |     |   |                |           |                     |       |       |       |       |
| 1.                          | CY-302   | Group Theory and Spectroscopy          | PCC       | 4            | 3                  | 1   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 2.                          | CY-304   | Solid State Chemistry and Applications | PCC       | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 3.                          | CY-306   | Organic Chemistry-IV                   | PCC       | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 4.                          | CY-312   | Inorganic Chemistry Laboratory         | PCC       | 4            | 0                  | 0   | 8 | 0              | 4         | 0                   | 25-35 | 20-30 | 0     | 40-50 |
| 5.                          | CY-316   | Art of Scientific/ Technical Writing   | PCC       | 2            | 2                  | 0   | 0 | 2              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 6.                          | CY-398   | Educational Tour                       | PCC       | 0            | 0                  | 0   | 0 | 0              | 0         | 0                   | 0     | 0     | 0     | 0     |
| 7.                          | BM-ELE   | Management Studies Elective Course     | HSSMEC    | 3            | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
| 8.                          | MSC-1    | Minor Specialization Course-I          | MSC       | 3/4          | 3                  | 0/1 | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |
|                             |          | <b>Total</b>                           |           | <b>19-23</b> |                    |     |   |                |           |                     |       |       |       |       |

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*[Signature]*

Program Code: **XX BS-MS (Chemical Sciences)**  
 Department: **CY Chemistry**  
 Year: **IV**

| Teaching Scheme        |          |                                 |                    |         | Contact Hours/Week |     |   | Exam. Duration |           | Relative Weight (%) |       |       |       |       |   |
|------------------------|----------|---------------------------------|--------------------|---------|--------------------|-----|---|----------------|-----------|---------------------|-------|-------|-------|-------|---|
| S. No.                 | Sub Code | Courses Title                   | Sub. Area          | Credits | L                  | T   | P | Theory         | Practical | CWS                 | PRS   | MTE   | ETE   | PRE   |   |
| Semester-VII (Autumn)  |          |                                 |                    |         |                    |     |   |                |           |                     |       |       |       |       |   |
| 1.                     | CY-521   | Advanced Analytical Methods     | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 2.                     | CY-523   | Organic Chemistry-V             | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 3.                     | CY-525   | Advanced Molecular Spectroscopy | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 4.                     | CY-531   | Physical Chemistry Laboratory   | PCC                | 4       | 0                  | 0   | 8 | 0              | 4         | 0                   | 25-35 | 20-30 | 0     | 40-50 |   |
| 5.                     | CY-ELE3  | Program Elective-3              | PEC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 6.                     | MSC-2    | Minor Specialization Course-II  | MSC                | 3/4     | 3                  | 0/1 | 0 | 0              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 7.                     | MSC-3    | Minor Specialization Course-III | MSC                | 3/4     | 3                  | 0/1 | 0 | 0              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
|                        |          | Total                           |                    | 16-24   |                    |     |   |                |           |                     |       |       |       |       |   |
| Semester-VIII (Spring) |          |                                 |                    |         |                    |     |   |                |           |                     |       |       |       |       |   |
| 1.                     | CY-522   | Materials Chemistry             | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 2.                     | CY-524   | Frontier Inorganic Chemistry    | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 3.                     | CY-526   | Organic Chemistry-VI            | PCC                | 3       | 3                  | 0   | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 5.                     | CY-ELE4  | Program Elective-4              | Project*<br>CY-500 | PEC     | 4                  | 3   | 1 | 0              | 3         | 0                   | 20-35 | 0     | 20-30 | 40-50 | 0 |
| 6.                     | CY-ELE5  | Program Elective-5              |                    | PEC     | 4                  | 3   | 1 | 0              | 3         | 0                   | 20-35 | 0     | 20-30 | 40-50 | 0 |
| 7.                     | MSC-4    | Minor Specialization Course-IV  | MSC                | 3/4     | 3                  | 0/1 | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
| 7.                     | MSC-5    | Minor Specialization Course-V   | MSC                | 3/4     | 3                  | 0/1 | 0 | 3              | 0         | 20-35               | 0     | 20-30 | 40-50 | 0     |   |
|                        |          | Total                           |                    | 17-25   |                    |     |   |                |           |                     |       |       |       |       |   |

Note: Students wishing to have BS Degree in Chemical Sciences they must inform to Dean (Academic Affairs) about their option before completing 7<sup>th</sup> semester and they may exit the program at the end of 4<sup>th</sup> year.

\*Compulsory for BS Degree students

Program Code: **XX BS-MS (Chemical Sciences)**  
 Department: **CY Chemistry**  
 Year: **V**

| Teaching Scheme             |          |                    |           |           | Contact Hours/Week |   |    | Exam. Duration |           | Relative Weight (%) |     |       |       |     |
|-----------------------------|----------|--------------------|-----------|-----------|--------------------|---|----|----------------|-----------|---------------------|-----|-------|-------|-----|
| S. No.                      | Sub Code | Courses Title      | Sub. Area | Credits   | L                  | T | P  | Theory         | Practical | CWS                 | PRS | MTE   | ETE   | PRE |
| <b>Semester-IX (Autumn)</b> |          |                    |           |           |                    |   |    |                |           |                     |     |       |       |     |
| 1.                          | CY-600A  | Thesis Stage I     | THE       | 4         | 0                  | 0 | 8  | 0              | 0         | 0                   | 0   | 0     | 100   | 0   |
| 2.                          | CY-ELE6  | Program Elective-6 | PEC       | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 3.                          | CY-ELE7  | Program Elective-7 | PEC       | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 4.                          | CY-ELE8  | Program Elective-8 | PEC       | 3         | 3                  | 0 | 0  | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 5.                          | CY-699   | Seminar            | PCC       | 2         | 0                  | 0 | 0  | 0              | 0         | 0                   | 0   | 0     | 100   | 0   |
|                             |          | <b>Total</b>       |           | <b>15</b> |                    |   |    |                |           |                     |     |       |       |     |
| <b>Semester-X (Spring)</b>  |          |                    |           |           |                    |   |    |                |           |                     |     |       |       |     |
| 1.                          | CY-600B  | Thesis Stage II    | THE       | 12        | 0                  | 0 | 24 | 0              | 0         | 0                   | 0   | 0     | 100   | 0   |
|                             |          | <b>Total</b>       |           | <b>12</b> |                    |   |    |                |           |                     |     |       |       |     |

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### List of Program Elective Courses

| Teaching Scheme |          |                                                  |           |         | Contact Hours/Week |   |     | Exam. Duration |           | Relative Weight (%) |     |       |       |     |
|-----------------|----------|--------------------------------------------------|-----------|---------|--------------------|---|-----|----------------|-----------|---------------------|-----|-------|-------|-----|
| S. No.          | Sub Code | Courses Title                                    | Sub. Area | Credits | L                  | T | P   | Theory         | Practical | CWS                 | PRS | MTE   | ETE   | PRE |
| 1.              | CY-210   | Bioinorganic and Biomimetic Chemistry            | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 2.              | CY-309   | Chemistry of Industrial Processes                | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 3.              | CY-512   | Nuclear and Radiochemistry                       | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 4.              | CY-514   | Heterocyclic Chemistry                           | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 5.              | CY-518   | Structure, Bonding and Properties of Solids      | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 6.              | CY-606   | Total Synthesis                                  | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 7.              | CY-607   | Electroanalytical Chemistry                      | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 8.              | CY-608   | Chemical Biology                                 | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 9.              | CY-609   | Inorganic Biochemistry and Reaction Mechanism    | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 10.             | CY-610   | Molecular Modeling and Simulations               | PEC       | 3       | 2                  | 0 | 2/2 | 2              | 0         | 15-30               | 20  | 15-25 | 30-40 | 0   |
| 11.             | CY-612   | Carbon Nanomaterials and their Applications      | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 12.             | CY-613   | Frontiers in Inorganic Biochemistry              | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 13.             | CY-614   | Asymmetric Synthesis                             | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 14.             | CY-615   | Crystal and Molecular Structure                  | PEC       | 3       | 2                  | 0 | 2/2 | 2              | 0         | 15-30               | 20  | 15-25 | 30-40 | 0   |
| 15.             | CY-617   | Supramolecular Chemistry                         | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 16.             | CY-619   | Modern Organic Synthetic Methods                 | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 17.             | CY-621   | Organic Structure Determination                  | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 18.             | CY-623   | Organic Semiconductors                           | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 19.             | CY-625   | Proteins and Polypeptides                        | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 20.             | CY-627   | Advanced Surface and Colloidal Chemistry         | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |
| 21.             | CY-633   | Nanoscale Materials: Properties and Applications | PEC       | 3       | 3                  | 0 | 0   | 3              | 0         | 20-35               | 0   | 20-30 | 40-50 | 0   |

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|     |        |                                                                                 |     |   |   |   |   |   |   |       |   |       |       |   |
|-----|--------|---------------------------------------------------------------------------------|-----|---|---|---|---|---|---|-------|---|-------|-------|---|
| 22. | CY-635 | Advanced Magnetic Resonance Spectroscopy                                        | PEC | 3 | 3 | 0 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 23. | CY-638 | Reactivity, Structure Determination, Devices and Electronic Structure of Solids | PEC | 3 | 2 | 0 | 2 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 24. | CY-703 | Advanced Material Characterization Techniques                                   | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 25. | CY-902 | Advanced Inorganic Chemistry                                                    | PEC | 3 | 3 | 0 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 26. | CY-903 | Advanced Organic Chemistry                                                      | PEC | 3 | 3 | 0 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 27. | CY-904 | Advanced Physical Chemistry                                                     | PEC | 3 | 3 | 0 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |
| 28. | CY-905 | Spectroscopic Methods of Structural Elucidation                                 | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | 0 | 20-30 | 40-50 | 0 |



**DEPARTMENT OF PHYSICS  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

**Credits for BS-MS (Physics) Program**

| CURRICULAR COMPONENTS                                                           | Credits |
|---------------------------------------------------------------------------------|---------|
| <b>(a) Institute Core Courses</b>                                               |         |
| (i) Humanities and Social Sciences (HSSC)                                       | 04      |
| (ii) Basic Sciences (BSC)                                                       | 16      |
| (iii) Engineering Science (ESC)                                                 | 08      |
| (iv) General Sciences (GSC)                                                     | 03      |
| Total                                                                           | 31      |
| <b>(b) Program Core Courses (PCC)</b>                                           |         |
| i. Class Contact Core courses                                                   | 94      |
| ii. Introduction to (Discipline) Engineering/Sciences                           | 02      |
| iii. Technical Communication                                                    | 02      |
| iv. Project/Thesis                                                              | 16      |
| v. Seminar                                                                      | 2       |
| vi. Educational Industrial Tour                                                 | -       |
| Total                                                                           | 116     |
| <b>(c) Humanities, Social Sciences and Management Elective Courses (HSSMEC)</b> |         |
| i. Humanities and Social Sciences                                               | 03      |
| ii. Management Studies                                                          | 03      |
| Total                                                                           | 06      |
| <b>(d) Open Elective Course (OEC)</b>                                           | 03      |
| <b>(e) Programme Elective Courses (PEC)</b>                                     | 30-33   |
| <b>(f) Minor Specialisation Courses (MSC)/Departmental Honour Courses (DHC)</b> | 18-20   |
| <b>(g) Co-curricular Activities (CCA)</b>                                       |         |
| i. Discipline (To be awarded after Final Year)                                  | 02      |
| ii. NCC/NSO/NSS (First Year)*                                                   | -       |
| Total                                                                           | 02      |
| <b>Grand Total</b><br>(For those who exit after BS program)                     | 161-164 |



**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

|                                                                                                              |         |
|--------------------------------------------------------------------------------------------------------------|---------|
| <b>Grand Total</b><br>(For those who opt for degree with minor specialisation or honours with BS program)    | 179-184 |
| <b>Grand Total</b><br>(For those who opt BS-MS program)                                                      | 188-191 |
| <b>Grand Total</b><br>(For those who opt for degree with minor specialisation or honours with BS-MS program) | 206-211 |

\* The students opting for these proficiencies at first year level may be given certificate with the remark excellent/very good/ good/satisfactory/ unsatisfactory.

  
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**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: XX BS-MS in Physics

Department: PH Physics

Year: I

| 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 |
| <b>Autumn Semester</b> |              |                                         |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MA-001       | Mathematics - 1                         | BSC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PH-103       | Computer Programming                    | ESC          | 4         | 3                  | 0        | 2        | 3                    | 0         | 15-25               | 25  | 20-30 | 40-50 | -   |
| 3.                     | CYN-001      | Physical Chemistry                      | BSC          | 4         | 3                  | 0        | 0        | 0                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | HSS-10X      | Communication Skills                    | HSSC         | 2         | 1                  | 1        | 0        | 2                    | 0         | 25-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | HSS-10Y      | Introduction to Psychology              | HSSC         | 2         | 2                  | 0        | 0        | 0                    | 0         | 25-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | PH-101       | Introduction to Physical Science        | PCC          | 2         | 2                  | 0        | 0        |                      | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.                     | CEN-105      | Introduction to Environmental Studies   | GSC          | 3         | 3                  | 0        | 0        | 3                    |           |                     |     |       |       |     |
|                        |              | <b>TOTAL</b>                            |              | <b>21</b> | <b>17</b>          | <b>2</b> | <b>2</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                         |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                     | MA-002       | Mathematical Methods                    | BSC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PH-xxx       | Physics 1 (Mechanics and Relativity)    | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | PH-xxx       | Physics 2 (Electro Magnetic Theory)     | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PHN-xxx      | Basic Analog Electronics                | PCC          | 3         | 3                  | 0        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | PH-xxx       | Physics Lab 1 (Basic experiments)       | PCC          | 3         | 0                  | 0        | 6        | 0                    | 4         | -                   | 50  | -     | -     | 50  |
| 6.                     | CY-104       | General Organic and Inorganic Chemistry | BSC          | 4         | 3                  | 0        | 2        | 3                    | 2         | 15-25               | 25  | 20-30 | 40-50 | -   |
|                        |              | <b>TOTAL</b>                            |              | <b>22</b> | <b>15</b>          | <b>3</b> | <b>8</b> |                      |           |                     |     |       |       |     |

**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS in Physics**  
Department: **PH Physics**  
Year: **II**

| 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 |
| <b>Autumn Semester</b> |              |                                           |              |           |                    |          |           |                      |           |                     |     |       |       |     |
| 1.                     | MIN-108      | Mechanical Engineering Drawing            | ESC          | 4         | 2                  | 0        | 4         | 0                    | 4         | -                   | 50  | -     | -     | 50  |
| 2.                     | PH-xxx       | Quantum Physics                           | PCC          | 3         | 2                  | 1        | 0         | 2                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | PH-xxx       | Thermal Physics and Statistical Mechanics | PCC          | 4         | 3                  | 1        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PH-xxx       | Digital Electronics                       | PCC          | 3         | 3                  | 0        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | PH-xxx       | Physics Lab 2 (Thermal & Electronics)     | PCC          | 3         | 0                  | 0        | 6         | 0                    | 4         | -                   | 50  | -     | -     | 50  |
| 6.                     | HSS-ELE      | HSS Elective Course                       | HSS MEC      | 3         | 2                  | 1        | 0         | 0                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
|                        |              | <b>TOTAL</b>                              |              | <b>20</b> | <b>12</b>          | <b>3</b> | <b>10</b> |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                           |              |           |                    |          |           |                      |           |                     |     |       |       |     |
| 1.                     | PH-xxx       | Elements of condensed matter Physics      | PCC          | 3         | 3                  | 0        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PH-xxx       | Mathematical Physics I                    | PCC          | 3         | 3                  | 0        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | PH-xxx       | Applied Optics                            | PCC          | 4         | 3                  | 1        | 0         |                      | 2         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PH-xxx       | Nuclear Physics and its applications      | PCC          | 3         | 3                  | 0        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | PH-xxx       | Spectroscopy & Laser Physics              | PCC          | 3         | 3                  | 0        | 0         | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | PH-xxx       | Physics Lab 3 (Optics + Atomic Physics)   | PCC          | 3         | 0                  | 0        | 6         | 0                    | 6         | -                   | 50  | -     | -     | 50  |
| 7.                     | PH-xxx       | Technical Communication                   | PCC          | 2         | 1                  | 1        | 0         | 0                    | 0         | -                   | -   | 50    | 50    | -   |
|                        |              | <b>TOTAL</b>                              |              | <b>21</b> | <b>16</b>          | <b>2</b> | <b>6</b>  |                      |           |                     |     |       |       |     |

**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS in Physics**  
Department: **PH Physics**  
Year: **III**

| 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 |
| <b>Autumn Semester</b> |              |                                |              |                   |                    |     |   |                      |           |                     |     |       |       |     |
| 1.                     | PH-xxx       | Quantum Mechanics - I          | PCC          | 4                 | 3                  | 1   | - | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PH-xxx       | Mathematical Physics 2         | PCC          | 4                 | 3                  | 1   | - | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | PH-xxx       | Classical Electrodynamics      | PCC          | 4                 | 3                  | 1   | - | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PH-xxx       | Classical Mechanics            | PCC          | 4                 | 3                  | 1   | - | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | PH-xxx       | Physics Lab 4                  | PCC          | 3                 | 0                  | 0   | 6 | -                    | 3         | -                   | 50  | -     | -     | 50  |
| 6.                     | OEC          | OEC                            | OEC          | 3                 | 3                  | 0   | 0 | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
|                        |              | <b>Total</b>                   |              | <b>22</b>         |                    |     |   |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                                |              |                   |                    |     |   |                      |           |                     |     |       |       |     |
| 1.                     | PH-xxx       | Condensed Matter Physics       | PCC          | 3                 | 3                  | 0   | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                     | PH-xxx       | Statistical Mechanics          | PCC          | 3                 | 3                  | 0   | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                     | PH-xxx       | Quantum Mechanics - II         | PCC          | 4                 | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PH-xxx       | Atomic and Molecular Physics   | PCC          | 4                 | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                     | PH-xxx       | Nuclear and Particle Physics   | PCC          | 4                 | 3                  | 1   | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                     | PH-xxx       | Physics Lab 5                  | PCC          | 3                 | 0                  | 0   | 6 | 0                    | 3         | -                   | 50  | -     | -     | 50  |
| 7.                     | HSSMEC       | Management Elective            | HSSMEC       | 3                 | 3                  | 0   | 0 | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 8.                     | MSC-1        | Minor Specialization Course- I | MSC          | 3/4               | 3                  | 0/1 | 0 | 3                    | -         | 20-35               | -   | 20-30 | 40-50 | -   |
|                        |              | <b>Total</b>                   |              | <b>24/<br/>28</b> |                    |     |   |                      |           |                     |     |       |       |     |

**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS in Physics**  
Department: **PH Physics**  
Year: **IV**

| 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.              | PH-xxx       | Semiconductor Devices and Applications | PCC                | 4       | 3                  | 1   | -   | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 2.              | PH-xxx       | Plasma and space physics               | PCC                | 4       | 3                  | 1   | 0   | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 3.              | PH-xxx       | Programme Elective – I                 | PEC                | 3       | 3                  | 0   | 0   | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 4.              | PH-xxx       | Programme Elective – II                | PEC                | 3       | 3                  | 0   | 0   | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 5.              | PH-xxx       | Project* stage - 1 (optional)          | PEC                | 3       | 3                  | 0   | 0   | 3                    | 0         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 6.              | MSC-2        | Minor Specialization Course- II        | MSC                | 3/4     | 3                  | 0/1 | 0   | 3                    | -         | 20-35               | -     | 20-30 | 40-50 | -     |   |
| 7.              | MSC-3        | Minor Specialization Course- III       | MSC                | 3/4     | 3                  | 0/1 | 0   | 3                    | -         | 20-35               | -     | 20-30 | 40-50 | -     |   |
|                 |              | Total                                  |                    | 14/22   |                    |     |     |                      |           |                     |       |       |       |       |   |
| Spring Semester |              |                                        |                    |         |                    |     |     |                      |           |                     |       |       |       |       |   |
| 1.              | PH-xxx       | Programme Elective - III               | Project* stage - 2 | PEC     | 3                  | 3   | 0   | -                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | - |
| 2.              | PH-xxx       | Programme Elective - IV                |                    | PEC     | 3                  | 3   | 0   | -                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | - |
| 3.              | PH-xxx       | Programme Elective - V                 |                    | PEC     | 3                  | 3   | 0   | -                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | - |
| 4.              | PH-xxx       | Programme Elective - VI                |                    | PEC     | 3                  | 3   | 0   | -                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | - |
| 5.              | PH-xxx       | Programme Elective - VII               |                    | PEC     | 3                  | 3   | 0   | -                    | 3         | 0                   | 20-35 | -     | 20-30 | 40-50 | - |
| 6.              | MSC-4        | Minor Specialization Course-IV         |                    | MSC     | 3/4                | 3   | 0/1 | 0                    | 3         | -                   | 20-35 | -     | 20-30 | 40-50 | - |
| 7.              | MSC-4        | Minor Specialization Course-V          |                    | MSC     | 3/4                | 3   | 0/1 | 0                    | 3         | -                   | 20-35 | -     | 20-30 | 40-50 | - |
|                 |              | Total                                  |                    | 15/23   |                    |     |     |                      |           |                     |       |       |       |       |   |

\*Project only for 8 and above CGPA.

Students who wish to exit with BS Degree after four years must inform Dean of Academic Affairs before completing 7<sup>th</sup> Semester.

**DEPARTMENT OF PHYSICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **XX BS-MS in Physics**  
Department: **PH Physics**  
Year: **V**

| 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 |
| <b>Autumn Semester</b> |              |                           |              |           |                    |   |   |                      |           |                     |     |       |       |     |
| 1.                     | PH-xxx       | Seminar                   | PCC          | 2         | 0                  | 0 | 0 | 0                    | 0         | -                   | -   | -     | 100   | -   |
| 2.                     | PH-xxx       | Thesis stage - 1          | PCC          | 4         | -                  | - | - | -                    | -         | -                   | -   | 30    | 70    | -   |
| 3.                     | PHN-xxx      | Programme Elective – VIII | PEC          | 3         | 3                  | 0 | - | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PHN-xxx      | Programme Elective – IX   | PEC          | 3         | 3                  | 0 | - | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                     | PHN-xxx      | Programme Elective – X    | PEC          | 3         | 3                  | 0 | - | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
|                        |              | <b>Total</b>              |              | <b>15</b> |                    |   |   |                      |           |                     |     |       |       |     |
| <b>Spring Semester</b> |              |                           |              |           |                    |   |   |                      |           |                     |     |       |       |     |
| 1.                     | PHN-xxx      | Thesis stage - 2          | PCC          | 12        | -                  | - | - | -                    | -         | -                   | -   | 30    | 70    | -   |
|                        |              | <b>Total</b>              |              | <b>12</b> |                    |   |   |                      |           |                     |     |       |       |     |



**DEPARTMENT OF HYDRO AND RENEWABLE ENERGY  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **12 M.Tech. (Renewable and Hydro Energy)**  
Department: **HRE Department of Hydro and Renewable Energy**  
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 |
| <b>Semester-I (Autumn)</b>  |              |                                                              |              |           |                    |   |     |               |           |                     |     |       |       |     |
| 1.                          | AHN-510      | Hydropower Planning and Management (New)                     | PCC          | 4         | 3                  | 1 | 0   | 3             | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                          | AHN-513      | Renewable Energy Resources Development Technology (Existing) | PCC          | 4         | 3                  | 1 | 2/2 | 3             | 0         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 3.                          |              | Program Elective-I                                           | PEC          | 4         | -                  | - | -   | -             | -         | -                   | -   | -     | -     | -   |
| 4.                          |              | Program Elective-II                                          | PEC          | 4         | -                  | - | -   | -             | -         | -                   | -   | -     | -     | -   |
| 5.                          |              | Program Elective-III                                         | PEC          | 4         | -                  | - | -   | -             | -         | -                   | -   | -     | -     | -   |
|                             |              | <b>Total</b>                                                 |              | <b>20</b> |                    |   |     |               |           |                     |     |       |       |     |
| <b>Semester-II (Spring)</b> |              |                                                              |              |           |                    |   |     |               |           |                     |     |       |       |     |
| 1.                          | AHN-583      | Grid Integration of Renewable Energy (New)                   | PCC          | 4         | 3                  | 1 | 2/2 | 3             | 0         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 2.                          | AHN-584      | Finance, Policy and Regulations for Renewable Energy (New)   | PCC          | 4         | 3                  | 1 | 0   | 3             | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                          | AHN-700      | Seminar                                                      | SEM          | 2         | -                  | - | -   | -             | -         | -                   | -   | -     | 100   | -   |
| 4.                          |              | Program Elective-IV                                          | PEC          | 4         | -                  | - | -   | -             | -         | -                   | -   | -     | -     | -   |
| 5.                          |              | Program Elective-V                                           | PEC          | 4         | -                  | - | -   | -             | -         | -                   | -   | -     | -     | -   |
|                             |              | <b>Total</b>                                                 |              | <b>18</b> |                    |   |     |               |           |                     |     |       |       |     |

**DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

Program Code: **12 M.Tech. (Renewable and Hydro Energy)**  
Department: **HRE Department of Hydro and Renewable Energy**  
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 |
| <b>Semester- I (Autumn)</b>                                                                    |              |                                                   |              |           |                    |   |   |               |           |                     |     |     |     |     |
| 1.                                                                                             | AHN-701A     | Thesis Stage-I<br>(to be continued next semester) | DIS          | 12        | -                  | - | - | -             | -         | -                   | -   | -   | 100 | -   |
|                                                                                                |              | <b>Total</b>                                      |              | <b>12</b> |                    |   |   |               |           |                     |     |     |     |     |
| <b>Note: Students can take 1 or 2 audit courses as advised by the supervisor, if required.</b> |              |                                                   |              |           |                    |   |   |               |           |                     |     |     |     |     |
| <b>Semester-II (Spring)</b>                                                                    |              |                                                   |              |           |                    |   |   |               |           |                     |     |     |     |     |
| 1.                                                                                             | AHN-701B     | Thesis Stage-II<br>(continued from III semester)  | DIS          | 18        | -                  | - | - | -             | -         | -                   | -   | -   | 100 | -   |
|                                                                                                |              | <b>Total</b>                                      |              | <b>18</b> |                    |   |   |               |           |                     |     |     |     |     |

| Summary                            |           |    |    |    |
|------------------------------------|-----------|----|----|----|
| Semester                           | 1         | 2  | 3  | 4  |
| <b>Semester-wise Total Credits</b> | 20        | 18 | 12 | 18 |
| <b>Total Credits</b>               | <b>68</b> |    |    |    |

**Program Elective Courses M.Tech. (Renewable and Hydro Energy)**

| 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 |
| 1.              | AHN-514      | Hydro Electric Equipment (Existing PCC)                       | PEC          | 4       | 3                  | 1 | 2/2 | 3             | -         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 2.              | AHN-515      | Design of Hydropower Structures (New)                         | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.              | AHN-516      | Hydro mechanical Equipment (Existing PCC)                     | PEC          | 4       | 3                  | 1 | 2/2 | 3             | -         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 4.              | AHN-517A     | Modelling, Simulation & Computer Applications (Existing)      | PEC          | 4       | 3                  | 1 | 2/2 | 3             | -         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 5.              | AHN-518      | Environmental Planning and Management (Existing)              | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.              | AHN-522      | Wind Energy Application Technology (Existing)                 | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.              | AHN-526      | Instrumentation for Hydro Power Plants (Existing)             | PEC          | 4       | 3                  | 1 | 2/2 | 3             | -         | 15-30               | 20  | 15-25 | 30-40 | -   |
| 8.              | AHN-528      | Rural Electrical Energy System Planning and Design (Existing) | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 9.              | AHN-532      | Remote Sensing and GIS for Renewable Energy Planning (New)    | PEC          | 4       | 3                  | 0 | 2   | 3             | -         | 10-25               | 25  | 15-25 | 30-40 | -   |
| 10.             | AHN-534      | Construction Planning and Management (Existing)               | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 11.             | AHN-536      | Biomass Production and Utilisation (Existing)                 | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 12.             | AHN-540      | Solar Photo-Voltaic Design and Application (Existing)         | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 13.             | AHN-542      | Energy Conservation and Management (Existing)                 | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 14.             | AHN-580      | Climate Change and water Resources (Existing)                 | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 15.             | AHN-581      | Energy-water-food nexus (Existing)                            | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 16.             | AHN-582      | Electric Vehicular Technology (Existing)                      | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 17.             | AHN-585      | Energy Storage Systems (New)                                  | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |
| 18.             | AHN-586      | Hydrogen Economy (New)                                        | PEC          | 4       | 3                  | 1 | 0   | 3             | -         | 20-35               | -   | 20-30 | 40-50 | -   |

**Transfer of Course Credits from other institutes for award of degree for Master Students**

|     |                                                                                                                                                                                                                                                                                       |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) | Transfer of credits earned by the students from reputed institutions known for high academic standards in India and abroad, which have an MOU with the Institute concerning this aspect, be permitted.                                                                                |
| (2) | The students of IIT Roorkee, who have been nominated/ recommended by the Chairman, DAPC/ CAPC, and approved by Dean, Academic Affairs for pursuing study in such other institutions, will only be eligible for such transfer of credits.                                              |
| (3) | The subject wise study programme for each student and equivalence for transfer of credits based on the syllabi of the course of the host Institution to the Institute will be recommended by the Chairman, DAPC on case to case basis, and be approved by the Dean, Academic Affairs. |
| (4) | The credits earned in other institute will be transferred for award of degree.                                                                                                                                                                                                        |
| (5) | The maximum permissible limit for transfer of credits will be 24.                                                                                                                                                                                                                     |
| (6) | The subjects and grades earned will be indicated in the consolidate grade sheet/transcripts with the remark that the grades have been awarded by the host institution.                                                                                                                |



27 DEC 2021

M. Des. (Industrial Design)  
Teaching Scheme

I Year: Autumn Semester

| Teaching Scheme                                                                                                                                                        |             |                                          |              |         | Contact Hrs Per Week |   |    | Exam Duration |   | Relative Weightage % |       |       |       |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------|--------------|---------|----------------------|---|----|---------------|---|----------------------|-------|-------|-------|-------|
| S. No.                                                                                                                                                                 | Course Code | Course Title                             | Subject Area | Credits | L                    | T | P  | T             | P | CWS                  | PRS   | MTE   | ETE   | PRE   |
| 1                                                                                                                                                                      | IDN-501**   | Introduction to Design and Prototyping   | PCC          | Audit   | 15                   | 5 | 10 | 02            | - | 35                   | 35    | -     | 30    | -     |
| 2                                                                                                                                                                      | IDN-503     | Design Thinking                          | PCC          | 3       | 1                    | 0 | 4  | 2             | 0 | 10-25                | 25    | 15-25 | -     | 30-40 |
| 3                                                                                                                                                                      | IDN-505     | Elements and Principles of Visual Design | PCC          | 3       | 2                    | 1 | 0  | 2             | 0 | 20-35                | -     | 20-30 | 40-50 | -     |
| 4                                                                                                                                                                      | IDN-507     | Human Factor Design                      | PCC          | 3       | 1                    | 2 | 0  | 2             | 0 | 20-35                | -     | 20-30 | 40-50 | -     |
| 5                                                                                                                                                                      | IDN-509     | Materials and Manufacturing              | PCC          | 3       | 1                    | 1 | 2  | 2             | 0 | 10-25                | 25    | 15-25 | -     | 30-40 |
| 6                                                                                                                                                                      | IMN-503     | Effective Communication                  | PCC          | 2       | 1                    | 1 | 0  | 0             | 2 | 20-35                | 20-30 | -     | -     | 40-50 |
| 7                                                                                                                                                                      | IDN-513     | Ideation Project                         | PCC          | 4       | 1                    | 0 | 6  | -             | - | -                    | 100   | -     | -     | -     |
| 8                                                                                                                                                                      |             | Program Elective I                       | PEC          | 3/4     | -                    | - | -  | -             | - | -                    | -     | -     | -     | -     |
|                                                                                                                                                                        |             |                                          | Sub Total    | 21/22   |                      |   |    |               |   |                      |       |       |       |       |
| ** This is a foundation course which will be running for 7-10 days to give orientation of Design course. It will be held before actual start of the semester teaching. |             |                                          |              |         |                      |   |    |               |   |                      |       |       |       |       |

\*\* This is a foundation course which will be running for 7-10 days to give orientation of Design course. It will be held before actual start of the semester teaching.

  
27 DEC 2021

**IYear: Spring Semester**

| Teaching Scheme |             |                           |              |         | Contact Hrs Per Week |   |    | Exam Duration |   | Relative Weightage% |       |       |       |       |
|-----------------|-------------|---------------------------|--------------|---------|----------------------|---|----|---------------|---|---------------------|-------|-------|-------|-------|
| S. No.          | Course Code | Course Title              | Subject Area | Credits | L                    | T | P  | T             | P | CWS                 | PRS   | MTE   | ETE   | PRE   |
| 1               | IDN-502     | Design Methodology        | PCC          | 3       | 2                    | 0 | 2  | 2             | 0 | 10-25               | 25    | 15-25 | 30-40 | -     |
| 2               | IDN-504     | Form Design               | PCC          | 3       | 1                    | 0 | 4  | 0             | 4 | 20-35               | 20-30 | -     | -     | 40-50 |
| 3               | IDN-506     | Design for Sustainability | PCC          | 3       | 2                    | 1 | 0  | 2             | 0 | 20-35               | -     | 20-30 | 40-50 | -     |
| 4               | IDN-508     | Creation Project          | PCC          | 5       | -                    | - | 10 | -             | - | -                   | 100   | -     | -     | -     |
| 5               | IDN-510     | Design Seminar            | PCC          | 2       | -                    | - | 4  | -             | - | -                   | 100   | -     | -     | -     |
| 6               |             | Program Elective II       | PEC          | 3/4     | -                    | - | -  | -             | - | -                   | -     | -     | -     | -     |
| 7               |             | Program Elective III      | PEC          | 3       | -                    | - | -  | -             | - | -                   | -     | -     | -     | -     |
| Sub Total       |             |                           |              | 22/23   |                      |   |    |               |   |                     |       |       |       |       |

**IIYear: Autumn Semester**

| Teaching Scheme |             |                                                              |              |        | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |     |       |     |
|-----------------|-------------|--------------------------------------------------------------|--------------|--------|----------------------|---|---|---------------|---|---------------------|-----|-----|-------|-----|
| S. No.          | Course Code | Course Title                                                 | Subject Area | Credit | L                    | T | P | T             | P | CWS                 | PRS | MTE | ETE   | PRE |
| 1               | IDN-702     | Internship<br>(Industrial Training/ Project/<br>Interaction) | SEM          | 4      | -                    | - | - | -             | - | -                   | -   | -   | 100ss | -   |
| 2               |             | Program Elective IV                                          | PEC          | 3/4    | -                    | - | - | -             | - | -                   | -   | -   | -     | -   |
| 3               |             | Program Elective V*                                          | PEC          | 3      | -                    | - | - | -             | - | -                   | -   | -   | -     | -   |
| 4               | IDN-701A    | Design Project (Phase-I)                                     | DIS          | 5      | -                    | - | - | -             | - | -                   | -   | -   | 100   | -   |
| Sub Total       |             |                                                              |              | 15/16  |                      |   |   |               |   |                     |     |     |       |     |



\$\$ Evaluation scheme: (Industry: 40 + Institute: 60) Internship will be completed during summer break.

\*May be completed through online mode (for example, NPTEL).

**II Year: Spring Semester**

| Teaching Scheme |                |                             |                 |        | Contact Hrs<br>Per Week |   |   | Exam<br>Duration |   | Relative Weightage % |     |     |     |     |
|-----------------|----------------|-----------------------------|-----------------|--------|-------------------------|---|---|------------------|---|----------------------|-----|-----|-----|-----|
| S. No.          | Course<br>Code | Course Title                | Subject<br>Area | Credit | L                       | T | P | T                | P | CWS                  | PRS | MTE | ETE | PRE |
| 1               | IDN-701 B      | Design Project (Phase – II) | DIS             | 12     | -                       | - | - | -                | - | -                    | -   | -   | 100 | -   |
|                 |                | Sub Total                   |                 | 12     |                         |   |   |                  |   |                      |     |     |     |     |
|                 |                | Total                       |                 | 70/73  |                         |   |   |                  |   |                      |     |     |     |     |

# **Basket of Elective Courses for M. Des. (Industrial Design)**

## **Basket 1 Engineering Group**

| Teaching Scheme        |             |                                             |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |       |       |     |
|------------------------|-------------|---------------------------------------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-----|-------|-------|-----|
| S. No.                 | Course Code | Course Title                                | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS | MTE   | ETE   | PRE |
| <b>First Semester</b>  |             |                                             |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1                      | IDN-521     | Sensors, Actuators and IOT                  | PEC          | 3       | 2                    | 0 | 2 | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| 2                      | IDN-522     | Computer Aided Design                       | PEC          | 3       | 2                    | 0 | 2 | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| 3                      | IDN-523     | Rapid Prototyping                           | PEC          | 3       | 2                    | 0 | 2 | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| 4                      | IDN-546     | Product Design                              | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 5                      | EEN-524     | Intelligent Sensors and Instrumentation     | PEC          | 4       | 3                    | 0 | 2 | 3             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| <b>Second Semester</b> |             |                                             |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1                      | ECN-578     | Digital Systems Design                      | PEC          | 4       | 3                    | 1 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2                      | IDN-525     | CAE in Product Design                       | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3                      | IDN-526     | Reverse Engineering                         | PEC          | 3       | 2                    | 0 | 2 | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| <b>Third Semester</b>  |             |                                             |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1                      | IDN-527     | Artificial Intelligence and Data Science    | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2                      | IDN-547     | Manufacturing Guidelines for Product Design | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3                      | AID-505     | Machine Learning                            | PEC          | 4       | 3                    | 1 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |

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**Basket 2 Management Group**

| Teaching Scheme |                        |                                  |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |       |       |     |
|-----------------|------------------------|----------------------------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-----|-------|-------|-----|
| S. No.          | Course Code            | Course Title                     | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS | MTE   | ETE   | PRE |
|                 | <b>First Semester</b>  |                                  |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1               | IDN-528                | Product Planning and Marketing   | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
|                 | <b>Second Semester</b> |                                  |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1               | IMN-505                | Business Valuation               | PEC          | 3       | 2                    | 1 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2               | IDN-530                | Business and Service Innovation  | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3               | IMN-506                | Intellectual Property Management | PEC          | 3       | 2                    | 1 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 4               | IMN-510                | Product Innovation Management    | PEC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
|                 | <b>Third Semester</b>  |                                  |              |         |                      |   |   |               |   |                     |     |       |       |     |
| 1               | IDN-531                | Legal Standards/IPR              | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2               | IDN-532                | Systems Thinking                 | PEC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |

**Basket 3 Design Group**

| Teaching Scheme        |             |                                         |              |         | Contact Hrs Per Week |   |     | Exam Duration |   | Relative Weightage% |     |       |       |     |
|------------------------|-------------|-----------------------------------------|--------------|---------|----------------------|---|-----|---------------|---|---------------------|-----|-------|-------|-----|
| S. No.                 | Course Code | Course Title                            | Subject Area | Credits | L                    | T | P   | T             | P | CWS                 | PRS | MTE   | ETE   | PRE |
| <b>First Semester</b>  |             |                                         |              |         |                      |   |     |               |   |                     |     |       |       |     |
| 1                      | IDN-533     | User Experience Design                  | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Second Semester</b> |             |                                         |              |         |                      |   |     |               |   |                     |     |       |       |     |
| 1                      | IDN-534     | Interaction Design                      | PEC          | 3       | 2                    | 0 | 2   | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| 2                      | IDN-536     | Service Design                          | PEC          | 3       | 2                    | 1 | 0   | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3                      | IDN-537     | Research into Design                    | PEC          | 3       | 2                    | 1 | 0   | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 4                      | IDN-538     | Bio Inspired Design                     | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 5                      | IDN-548     | Inter-Disciplinary Design               | PEC          | 3       | 2                    | 0 | 2/2 | 2             | 0 | 15-30               | 20  | 15-25 | 30-40 | -   |
| 6                      | IDN-549     | Design for Social Inclusion             | PEC          | 3       | 2                    | 0 | 2/2 | 2             | 0 | 15-30               | 20  | 15-25 | 30-40 | -   |
| <b>Third Semester</b>  |             |                                         |              |         |                      |   |     |               |   |                     |     |       |       |     |
| 1                      | IDN-535     | Mobility Design                         | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2                      | IDN-539     | Computer Game Design                    | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3                      | IDN-540     | Design for Society                      | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 4                      | IDN-541     | Graphic Design                          | PEC          | 3       | 2                    | 0 | 2   | 2             | 0 | 10-25               | 25  | 15-25 | 30-40 | -   |
| 5                      | IDN-542     | Product Detailing                       | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 6                      | IDN-543     | Contemporary Visual Design              | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 7                      | IDN-544     | Representation Techniques for Animation | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 8                      | IDN-545     | Visual Narrative                        | PEC          | 3       | 3                    | 0 | 0   | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |

**Basket 4 On-line mode: NPTEL**

A list of approved NPTEL courses by DAPC will be provided to students.

□ Course duration: 20hrs

**The courses will be PEC without laboratory work**

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# MIM (Masters in Innovation Management)

## Teaching Scheme

### I Year: Autumn Semester

| Teaching Scheme |             |                                        |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |       |       |       |       |
|-----------------|-------------|----------------------------------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-------|-------|-------|-------|
| S. No.          | Course Code | Course Title                           | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS   | MTE   | ETE   | PRE   |
| 1               | IDN-503     | Design Thinking                        | PCC          | 3       | 1                    | 0 | 4 | 2             | 0 | 10-25               | 25    | 15-25 | -     | 30-40 |
| 2               | IMN-503     | Effective Communication                | PCC          | 2       | 1                    | 1 | 0 | 0             | 2 | 20-35               | 20-30 | -     | -     | 40-50 |
| 3               | IMN-505     | Business Valuation                     | PCC          | 3       | 2                    | 1 | 0 | 2             | 0 | 20-35               | -     | 20-30 | 40-50 | -     |
| 4               | IMN-507     | Innovative Entrepreneurship Strategies | PCC          | 3       | 2                    | 0 | 2 | 2             | 0 | 10-25               | 25    | 15-25 | 30-40 | -     |
| 5               | IMN-509     | Legal Aspects of Business              | PCC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -     | 20-30 | 40-50 | -     |
| 6               | IMN-511     | Business Decision Making               | PCC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -     | 20-30 | 40-50 | -     |
| 7               | IMN-513     | Contemporary Management Practices      | PCC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -     | 20-30 | 40-50 | -     |
| Sub Total       |             |                                        |              | 18      |                      |   |   |               |   |                     |       |       |       |       |

### I Year: Spring Semester

| Teaching Scheme |             |                                         |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |       |       |     |
|-----------------|-------------|-----------------------------------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-----|-------|-------|-----|
| S. No.          | Course Code | Course Title                            | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS | MTE   | ETE   | PRE |
| 1               | IMN-502     | Technology Management                   | PCC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 2               | IMN-504     | Contemporary Strategic Management       | PCC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 3               | IMN-506     | Intellectual Property Management        | PCC          | 3       | 2                    | 1 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 4               | IMN-508     | Process Innovation Management           | PCC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 5               | IMN-510     | Product Innovation Management           | PCC          | 2       | 2                    | 0 | 0 | 2             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 6               | IMN-512     | Innovative Services and Business Models | PCC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| 7               | IMN-514     | Financing and Marketing of Innovation   | PCC          | 3       | 3                    | 0 | 0 | 3             | 0 | 20-35               | -   | 20-30 | 40-50 | -   |
| Sub Total       |             |                                         |              | 18      |                      |   |   |               |   |                     |     |       |       |     |



**II Year: Autumn Semester**

| Teaching Scheme |             |                 |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |     |     |     |
|-----------------|-------------|-----------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-----|-----|-----|-----|
| S. No.          | Course Code | Course Title    | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS | MTE | ETE | PRE |
| 1               | IMN-601     | Summer Training | SEM          | 3       | -                    | - | - | -             | - | -                   | -   | -   | 100 | -   |
| 2               | IMN-602     | Project         | RP           | 2       | -                    | - | - | -             | - | -                   | -   | -   | 100 | -   |
| 3               |             | Elective I      | PEC          | 3       | -                    | - | - | -             | - | -                   | -   | -   | -   | -   |
| 4               |             | Elective II     | PEC          | 3       | -                    | - | - | -             | - | -                   | -   | -   | -   | -   |
| 5               |             | Elective III    | PEC          | 3       | -                    | - | - | -             | - | -                   | -   | -   | -   | -   |
| 6               |             | Elective IV     | PEC          | 3       | -                    | - | - | -             | - | -                   | -   | -   | -   | -   |
| 7               |             | Elective V      | PEC          | 3       | -                    | - | - | -             | - | -                   | -   | -   | -   | -   |
| Sub Total       |             |                 |              | 20      |                      |   |   |               |   |                     |     |     |     |     |

**II Year: Spring Semester**

| Teaching Scheme |             |                                  |              |         | Contact Hrs Per Week |   |   | Exam Duration |   | Relative Weightage% |     |     |     |     |
|-----------------|-------------|----------------------------------|--------------|---------|----------------------|---|---|---------------|---|---------------------|-----|-----|-----|-----|
| S. No.          | Course Code | Course Title                     | Subject Area | Credits | L                    | T | P | T             | P | CWS                 | PRS | MTE | ETE | PRE |
| 1               | IMN-603     | Project (Continued from Sem III) | RP           | 18      | -                    | - | - | -             | - | -                   | -   | -   | 100 | -   |
| Sub Total       |             |                                  |              | 18      |                      |   |   |               |   |                     |     |     |     |     |
| Grand Total     |             |                                  |              | 74      |                      |   |   |               |   |                     |     |     |     |     |

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**List of Elective Courses for MIM (Masters in Innovation Management):**

| S. No. | Course Code | Subject Name                                    | Credit | L | T | P | Exam Dur. (Hrs) |   | Relative Weightage (%) |     |       |       |     |
|--------|-------------|-------------------------------------------------|--------|---|---|---|-----------------|---|------------------------|-----|-------|-------|-----|
|        |             |                                                 |        |   |   |   | T               | P | CWS                    | PRS | MTE   | ETE   | PRE |
| 1      | IMN-521     | IP Portfolio Management                         | 3      | 2 | 1 | 0 | 2               | 0 | 20-35                  | -   | 20-30 | 40-50 | -   |
| 2      | IMN-522     | Intellectual Value and Corporate Value Creation | 3      | 2 | 1 | 0 | 2               | 0 | 20-35                  | -   | 20-30 | 40-50 | -   |
| 3      | IMN-523     | Licensing and Commercialization of IP           | 3      | 2 | 1 | 0 | 2               | 0 | 20-35                  | -   | 20-30 | 40-50 | -   |
| 4      | IMN-524     | Diffusion of Innovations in Social networks     | 3      | 2 | 1 | 0 | 2               | 0 | 20-35                  | -   | 20-30 | 40-50 | -   |
| 5      | IMN-525     | Design for Extreme Affordability                | 3      | 2 | 1 | 0 | 2               | 0 | 20-35                  | -   | 20-30 | 40-50 | -   |

\* All the elective subjects for M.Des Course are also available for the students of MIM as PECs.

**Appendix - H**  
**Item No. Senate / 89.12**

After receiving the comments from IAPC members (Prof. Tanuja Srivastava, Mathematics, and Prof. C. N. Ramchandran, Associate Dean, Academic Affairs), a meeting related to Switchover program from M.Sc. to Ph.D. was held via Webex on August 24, 2021. The following guidelines for the switchover are suggested:

1. The students at the end of M.Sc. third semester will apply against an advertisement from the Institute for the switchover from M.Sc. to Ph.D. program.
2. The CGPA of the applicant should be 8.5 or above at the end of third semester.
3. IIT Roorkee can give fellowship to the selected candidate without valid GATE/NET w.e.f. the date of switchover from M. Sc. to the Ph. D. programme.
4. Selection of candidates for the switchover program shall be through extended DRC where all faculty members can participate. The mode of selection of the candidates may be decided by the DRC. A candidate who is applying under this program may give consent of his/her supervisor(s) at the time of selection process. A Ph.D. supervisor shall be allotted to him/her and SRC must be formed which decides about the courses that need to be completed.
5. The selected candidate should take Pre-Ph.D. courses in the fourth semester of the M.Sc. program in order to meet the credit requirements for Ph.D. program. The minimum credit requirements for the candidates admitted under this program shall be less than the normal candidates joining Ph.D. program in the Institute under regular admission process. The suggested minimum credit requirement for the candidate is 8 (in addition to the mandatory seminar (2 credits)). However, the SRC may recommend additional credit requirements for the student based on the research area and background of the student.
6. The minimum CGPA at the end of fourth semester shall be 8.5. If it is less than the minimum CGPA, the student has to take extra courses as suggested by the SRC to maintain the CGPA.
7. After completion of four semesters, the candidate can appear for the comprehensive exam if he/she fulfills the credit requirements and if declared successful in the comprehensive examination can present his/her research proposal for the completion of candidacy.
8. After the completion of candidacy, the candidates admitted under the switchover program will be treated on par with the candidates who were admitted under regular admission process with respect to Ph.D. regulations of the institute.

  
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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Revised Structure (To be implemented from academic session 2022-2023)**

Program Code : 613 M.Sc. (Mathematics)  
 Department : MA Mathematics  
 Year : I

| 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 |
| <b>Semester-I (Autumn)</b>  |              |                                           |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                          | MA-401       | Abstract Algebra                          | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                          | MA-403       | Introduction to Computer Programming      | PCC          | 4         | 3                  | 0        | 2        | 3                    | 0         | 10-25               | 25  | 15-25 | 30-40 | -   |
| 3.                          | MA-405       | Linear Algebra                            | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                          | MA-407       | Probability and Statistics                | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                          | MA-409       | Real Analysis                             | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                          | MA-411       | Theory of Ordinary Differential Equations | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>                |              |                                           |              | <b>24</b> | <b>18</b>          | <b>5</b> | <b>2</b> |                      |           |                     |     |       |       |     |
| <b>Semester-II (Spring)</b> |              |                                           |              |           |                    |          |          |                      |           |                     |     |       |       |     |
| 1.                          | MA-402       | Complex Analysis                          | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                          | MA-404       | Functional Analysis                       | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                          | MA-406       | Technical Communication                   | PCC          | 2         |                    |          |          |                      |           | 100                 |     |       |       |     |
| 4.                          | MA-408       | Theory of Partial Differential Equations  | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                          | MA-410       | Topology                                  | PCC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                          | MA-ELE       | Program Elective-1                        | PEC          | 4         | 3                  | 1        | 0        | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>                |              |                                           |              | <b>22</b> | <b>17</b>          | <b>5</b> | <b>0</b> |                      |           |                     |     |       |       |     |

Appendix - I  
Item No. Senate / 89.16

27 DEC 2021

**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Revised Structure (To be implemented from academic session 2022-2023)**

Program Code : 613 M.Sc. (Mathematics)  
 Department : MA Mathematics  
 Year : II

| 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 |
| <b>Semester-III (Autumn)</b> |              |                     |              |           |                    |          |          |                     |           |                     |     |       |       |     |
| 1.                           | MA-501       | Numerical Analysis  | PCC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                           | MA-503       | Operations Research | PCC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                           | MA-ELE       | Program Elective-2  | PEC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                           | MA-ELE       | Program Elective-3  | PEC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>                 |              |                     |              | <b>16</b> | <b>12</b>          | <b>4</b> | <b>0</b> |                     |           | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Semester-IV (Spring)</b>  |              |                     |              |           |                    |          |          |                     |           |                     |     |       |       |     |
| 1.                           | MA-599       | Project             | PCC          | 8         | -                  | -        | -        | -                   | -         | -                   | -   | 30    | 70    | -   |
| 2.                           | MA-ELE       | Program Elective-4  | PEC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                           | MA-ELE       | Program Elective-5  | PEC          | 4         | 3                  | 1        | 0        | 3                   | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| <b>Total</b>                 |              |                     |              | <b>16</b> | <b>6</b>           | <b>2</b> | <b>0</b> |                     |           |                     |     |       |       |     |

| Summary       |    |                                                                                    |     |    |
|---------------|----|------------------------------------------------------------------------------------|-----|----|
| Semester      | I  | II                                                                                 | III | IV |
| Credits       | 24 | 22                                                                                 | 16  | 16 |
| Total Credits | 78 | (PEC: 20, PCC: 58 (including 8 credits for Project and 2 credits for Tech. Comm.)) |     |    |

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**DEPARTMENT OF MATHEMATICS**  
**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**  
**Proposed Revised Structure (To be implemented from academic session 2022-2023)**

**List of the Program Elective Courses**

**Program Code : 613 M.Sc. (Mathematics)**

**Department : MA MATHEMATICS**

| 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 |
| <b>Program Elective Courses (Elective-1 to Elective 5) to be chosen in First Year and Second Year</b> |              |                                         |              |         |                    |   |   |                      |           |                     |     |       |       |     |
| 1.                                                                                                    | MA-301       | Fluid Dynamics                          | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 2.                                                                                                    | MA-411       | Analytic Number Theory                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 3.                                                                                                    | MA-412       | Combinatorial Mathematics               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 4.                                                                                                    | MA-413       | Credit Risk Management                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 5.                                                                                                    | MA-414       | Differential Geometry                   | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 6.                                                                                                    | MA-415       | Financial Risk Management               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 7.                                                                                                    | MA-416       | Graph Theory                            | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 8.                                                                                                    | MA-417       | Mathematical Image Processing           | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 9.                                                                                                    | MA-418       | Numerical Optimization                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 10.                                                                                                   | MA-419       | Stochastic Calculus                     | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 11.                                                                                                   | MA-511       | Abstract Harmonic Analysis              | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 12.                                                                                                   | MA-512       | Advanced Complex Analysis               | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 13.                                                                                                   | MA-513       | Advanced Matrix Theory                  | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 14.                                                                                                   | MA-514       | Advanced Numerical Analysis             | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 15.                                                                                                   | MA-515       | Advanced Operations Research            | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |
| 16.                                                                                                   | MA-516       | Advanced Partial Differential Equations | PEC          | 4       | 3                  | 1 | 0 | 3                    | 0         | 20-35               | -   | 20-30 | 40-50 | -   |





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**Proposed Revised Structure (To be implemented from academic session 2022-2023)**

|     |        |                                               |     |   |   |   |   |   |   |       |   |       |       |   |
|-----|--------|-----------------------------------------------|-----|---|---|---|---|---|---|-------|---|-------|-------|---|
| 17. | MA-517 | Algebraic Number Theory                       | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 18. | MA-518 | Algebraic Topology                            | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 19. | MA-519 | Approximation Theory                          | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 20. | MA-520 | Coding Theory                                 | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 21. | MA-521 | Commutative Algebra                           | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 22. | MA-522 | Computational Fluid Dynamics                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 23. | MA-523 | Control Theory                                | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 24. | MA-524 | Dynamical Systems                             | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 25. | MA-525 | Financial Mathematics                         | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 26. | MA-526 | Finite Element Methods                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 27. | MA-527 | Fuzzy Sets and Fuzzy Systems                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 28. | MA-528 | Hyperbolic Conservation Laws                  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 29. | MA-529 | Integral Equations and Calculus of Variations | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 30. | MA-530 | Machine Learning in Finance                   | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 31. | MA-531 | Mathematical Biology                          | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 32. | MA-532 | Mathematical Cryptography                     | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 33. | MA-533 | Measure Theory                                | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 34. | MA-534 | Multivariate Techniques                       | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 35. | MA-535 | Numerical Linear Algebra                      | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 36. | MA-536 | Operator Theory                               | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 37. | MA-537 | Optimal Control Theory                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 38. | MA-538 | Orthogonal Polynomials and Special Functions  | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 39. | MA-539 | Portfolio Optimization                        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 40. | MA-540 | Regularization Theory for Inverse Problems    | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 41. | MA-541 | Representation Theory of Finite Groups        | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |

**DEPARTMENT OF MATHEMATICS**  
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**Proposed Revised Structure (To be implemented from academic session 2022-2023)**

|     |        |                                           |     |   |   |   |   |   |   |       |   |       |       |   |
|-----|--------|-------------------------------------------|-----|---|---|---|---|---|---|-------|---|-------|-------|---|
| 42. | MA-542 | Semigroup Theory and Applications         | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 43. | MA-543 | Sobolev Spaces and Applications           | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 44. | MA-544 | Statistical Inference                     | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 45. | MA-545 | Stochastic Differential Equations         | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 46. | MA-546 | Stochastic Partial Differential Equations | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |
| 47. | MA-547 | Wavelet Analysis                          | PEC | 4 | 3 | 1 | 0 | 3 | 0 | 20-35 | - | 20-30 | 40-50 | - |

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