Indian Institute of Technology Delhi

Curriculum Concept Note 2025

1. Outline of the Concept Note

The curriculum review committee (CRC) was constituted by the Director. After several meetings with various stakeholders, including all departments, the CRC had submitted its report on the implementation of the new curriculum.

https://owncloud.iitd.ac.in/nextcloud/index.php/s/qzmoM2iQBAkQDcx

The associated appendices A and B are placed in the following two links.

Appendix A:

https://owncloud.iitd.ac.in/nextcloud/index.php/s/yXqFzdEFXMGGLFp

Appendix B:

https://owncloud.iitd.ac.in/nextcloud/index.php/s/JzaLeCmW3JeWEdw

BAP in its Special meetings held on 26th & 29th September 2023 considered the draft proposal of the New Curriculum. After detailed discussions on the draft proposal, it was decided to send the proposal to Academic Units for obtaining comments /feedback. Also, the following subcommittees were formed by the Chairperson, BAP to merge the recommendations of the Core Committee, the feedback received from the Academic Unit, and the feedback received from the BAP.

UG Subcommittee

Prof. Anurag Goyal (ME), Prof. Seshan Srirangarajan (EE), Prof. Shantanu Ghosh (PH), Prof. Ramesh Narayanan (DESE), Ms. Kashish Goel (2021CS50602), Mr. Shwinder Singh (2020BB10056), Prof. Narayanan Kurur (Dean Academics), Prof. Shouri Chatterjee (Associate Dean Academics - Curriculum), Prof. Dhanya (Associate Dean Academics - PG Research), Prof. Subodh Sharma (Associate Dean Academics – Outreach & New Initiatives), Prof. Subhra Dutta (Timetable in-charge), Prof. Divesh Bhatia (Chairman, Grades and Registration).

PG Subcommittee

Prof. Kedar Khare (OPC), Prof. Shankar Prakriya (EE), Prof. Santosh Kapuria (AM), Prof. Suma Athreye (SPP), Mr. Dhaivat Bhatt (2022EEP2150), Mr. Hitesh Gupta (2019MEZ8589), Prof.

Narayanan Kurur (Dean Academics), Prof. Shouri Chatterjee (Associate Dean Academics - Curriculum), Prof. Dhanya (Associate Dean Academics - PG Research), Prof. Subodh Sharma (Associate Dean Academics – Outreach & New Initiatives), Prof. Subhra Dutta (Timetable in-charge), Prof. Divesh Bhatia (Chairman, Grades and Registration).

First year Teaching Subcommittee

Prof. Konijeti Sreenadh (MA), Prof. Sanjiva Prasad (CSE), Prof. Atul Narang (DBEB), Prof. Varsha Singh (HSS), Mr. Manas Choudhary (2020PH10709), Prof. Narayanan Kurur (Dean Academics), Prof. Shouri Chatterjee (Associate Dean Academics - Curriculum), Prof. Dhanya (Associate Dean Academics - PG Research), Prof. Subodh Sharma (Associate Dean Academics – Outreach & New Initiatives), Prof. Subhra Dutta (Timetable in-charge), Prof. Divesh Bhatia (Chairman, Grades and Registration).

The subcommittees met on several occasions in December 2023. The subcommittee recommendations were then presented before the BAP during the Special meeting of BAP on 17th and 31st January 2024 and 7th February 2024.

The recommendations of the BAP were forwarded to the CRC. The responses of the CRC to the recommendations of the BAP are given at:

https://owncloud.iitd.ac.in/nextcloud/index.php/s/mRQyoBXp5ytwErC

Most of the differences in the CRC rebuttal were in the undergraduate program. As such, the core members of the CRC were absorbed into the BAP UG subcommittee. The UG subcommittee members (including the CRC committee members Prof. Atul Narang and Prof. Gaurav Goel) met on 22nd August 2024 and revised the concept note to incorporate the BAP suggestions. The PG subcommittee members met on 3rd September 2024 and revised the concept note to incorporate the BAP suggestions.

The BAP met on the 11th, 12th, 13th, 17th and 18th September 2024 and discussed the proposal in fine detail. The final BAP recommended concept note is placed before the Senate for its consideration.

Based on the salient features of the curricula identified by the CRC, an attempt is made to state the learning objectives/outcomes of the different programs. The proposed curricula are designed to assess these learning objectives.

2. Credits and Expected Work

Before getting into the specifics, the relation between credits and amount of work expected is defined. As per Courses of Study 2013-2024, for each lecture or tutorial credit, the self-study component is 1-2 hours/week (for 100-600 level courses) and 3 hours/week (for 700-800 level

courses). The self-study component for practicals is 1 hour for every two hours of practicals per week. We propose that 1 credit amounts to, at most, 3 hours of work per week, which includes contact hours irrespective of level of course. We assume that the standard load for a full time student is 54 hours a week. Accordingly, the average number of credits for an undergraduate student is to be 18 credits a semester, and the average number of credits for an M.Tech student (who is required to be a TA/RA for 8 hours/week) is 15 credits per semester.

3. Proposal for Undergraduate Curriculum (Entry through JEE Advanced)

Curricular Principles

The review of the curriculum is based on the following broad principles.

A. Academic rigour: Provide a firm grounding in the fundamentals of science and engineering.
B. Flexibility: Provide multiple paths for students to tailor their undergraduate experience in a manner that allows for sufficient exploration and helps them better understand their inclinations and interests.
C. Emphasis on hands-on work: Fundamentally altering the nature of laboratory courses and projects.
D. Societal relevance and social responsibility: Sensitize students to the problems of sustainability and help them develop skills to address these problems.
E. Innovation and ethical leadership: The curriculum should encourage our students to be innovative and ethical leaders.
F. Communication and teamwork: The curriculum should enable a comprehensive and progressive development of an array of communication skills, ranging from summarization and presentation to technical writing and team communication. Team projects and peer learning must be encouraged.

Salient Features

The salient features of the recommendations of the CRC were:

i. Strong fundamental sciences and general engineering.
ii. Flexible pathways for different programs. The current Institute core courses are considered as core requirements that may be met through different paths.
iii. Focus on hands-on experience in the departmental courses. Early exposure of the student to the department.
iv. An increased exposure to the environment and sustainability.
v. Exposure to courses with creative expression and ethical reasoning, as well as courses that are new and emerging engineering trends.
vi. Introduction of a capstone project.

Learning Outcomes (LO)

The undergraduate curriculum at IIT Delhi aims for the following educational outcomes. IIT Delhi graduates would be able to:

i. analyze, synthesize and communicate ideas.
ii. demonstrate scientific temperament, integrity, personal and professional responsibility, and respect for others.
iii. identify, analyze and solve challenging problems within and across disciplines.
iv. apply their analytical skills to other areas of knowledge and design sustainable solutions to issues important in our society ethically.

Implementation Proposal: Assessment of Learning Outcomes

The outline of the proposed undergraduate curriculum is followed by a comparison chart between the current undergraduate curriculum, the original proposal of the CRC and that recommended here. A table mapping the course categories to the learning outcomes and curricular principles is also provided later.

A. BS: Basic Sciences (24 credits)

Two 4-credit Mathematics courses (like MTL100/101), Physics laboratory (2 credits), (like PYP100) Chemistry laboratory (2 credits) (like CMP100) will be common to all students. The remaining 12 credits will be structured as (LTP) 2-1-0 or 2-0-2 courses in Physics, Chemistry and Biology. Departments may select up to 3 courses, with one each in Physics, Chemistry and Biology (9 credits). The student is free to choose one more such course to complete the BS requirement. The BS category requires at least 5 practical units.

B. GE: General Engineering (24 credits)

All students are required to take one 4-credit introductory course in Computer Science (like COL100). This course would be offered in multiple flavours to cater to the different levels of preparation of incoming students.. For implementation convenience, we suggest that the remaining 20 credits are run as 4-credit or 2-credit courses. The remaining GE courses fall in one of three groups: Mechanical Sciences, Electrical Sciences, and Computational or Data Sciences. AUs may select up to 16 credits with at least one course from each basket. The remaining 4 credits in this category are left as student choice.

Suggested grouping of GE courses are given in the table below based on existing PL/EAS courses and is evolving. A course may be offered under the GE category only if two or more departments subscribe.

Computational or Data Sciences	Electrical Sciences	Mechanical Sciences
Engineering Visualization	Introduction to Electrical Engineering	Engineering Mechanics
Data Structures	Introduction to Electrical Engineering Laboratory	Product Realization
Numerical Methods and Computations	Digital Electronics	Thermodynamics
Differential Equations	Principles of Electronic Materials	Fluid Mechanics
Probability and Stochastic Processes	Physics of Nanomaterials	Experimental Methods
Signals and Systems	Introduction to Material Sciences	Heat Transfer
Introduction to Data Science		Transport Phenomena
		Solid Mechanics

C. ES: Environment and Sustainability (5 credits)

AUs are encouraged to propose and offer new courses to satisfy the ES requirement tailored to their own engineering disciplines. CVL100 is no longer mandatory.

D. SSW: Self, society, and the world (15 credits)

Students are required to take at least 9 credits of HUL courses in this category. The rest of the credits are student choice from among the courses offered deemed to be in this category (presently those offered by Department of Management Sciences and School of Public Policy). Guidelines for consideration of courses in this category will be outlined by a committee set up for this purpose. This standing committee will also decide whether new courses that are offered in future fall within the SSW category.

E. OC: Open category (9 credits)

Any course may be treated as OC, if not already counted under the other categories. OC is to provide flexibility to the student to explore as per their interest.

A total of 68 credits (BS 24 + GE 24 + ES 5 + SSW 15) is considered as the Institute requirement and provides for **breadth** required for the undergraduate degree. 68 ± 3 credits

are allocated for departmental core and departmental electives, for **depth** required for the undergraduate degree.

F. DC, DE: Departmental core and departmental electives (68 ± 3 credits)

a. The class size of the first DC course is restricted to around 30 students.

b. Courses may be designed to integrate Creative Expression (CR) and Ethical Reasoning (ER), as modules within multiple DC/DE courses. A student is to take at least 3 modules of CE/ER equivalent to 3 credits. Laboratory courses to encourage design thinking may be introduced in this category. [LO1, LO2]

c. Courses may be designed to showcase Emerging Trends (ET) in research and engineering, as modules within multiple DC/DE courses. A student is to take at least 3 modules of ET equivalent to 3 credits. [LO3]

d. Departmental Capstone project and BTP1 (both 0-0-6) are to be offered as DC/DE. A student is required to credit either BTP1 or the Departmental Capstone Project. BTP2 (0-0-24) is to be offered to BTech-Honours students. [LO1, LO4] Credits from BTP2 will not satisfy the DC/DE requirements of students.

e. Evaluation of the Departmental Capstone project should follow the following guidelines:

   i. The evaluation structure can be AU specific, however, it is expected that outcome-based evaluation will not be more than 50% of the project grade.

   ii. Student groups will be expected to clearly define milestones and roles within the team. Use of web repositories and collaboration platforms, such as Jupyter notebook, should be highly encouraged.

f. It is recommended that DC courses be restricted to a maximum of 3 lecture courses per semester over 5 semesters, without any restrictions on the laboratory component.

g. All programs are strongly recommended to incorporate experimental methods into their core laboratory course instruction and AI/ML in core courses, either in part or full. Further, professional ethics may be incorporated into the core courses.

G. NGU: Graded Pass-Fail Units (8 units)

NGUs have been administered since 2013. A committee is to be set up to define guidelines for NGUs. An assessment of the role of NGUs in the curriculum over the last 10 years is sought.

a. 1-2 units of NCC/NSS/NSO.

b. 2 units of language and writing skills.

c. 2-3 units of design and practical experience (DPE)

d. 2 units of life skills.

Mapping of course categories with learning outcomes and curricular principles

Category	LO1	LO2	LO3	LO4	CPA	CPB	CPC	CPD	CPE	CPF

BS	x		x		x	x	x			
GE	x		x		x	x	x			
ES		x		x				x	x	
SSW		x		x		x		x	x	
OC			x	x		x				
DC	x	x	x	x	x		x			x
DE						x				x

BTech with Honours

The honours program is to encourage students to remain in the core domain. As such, no entry bar is envisaged. An additional 18 credits in the department will enable a student to graduate with honours. As 18 credits, a student may complete a 12-credit BTP-2 along with 2 3-credit electives. Alternatively, a student may take 6 3-credit electives for the purpose. Note that the BTP2 can only be utilized by students in the honours program. BTP2 will not satisfy ordinary DC/DE credits.

Minor Areas

As currently implemented, minor areas outside the department may continue to be offered. A student will require 20 credits in the minor area to complete the requirement. 10 OC credits may be waived for this purpose.

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First Year Schedule

Semester-1	**Semester-2**
Calculus (4 credits)	Linear Algebra (4 credits)
2 Dept. recommended GE courses (8 credits)	1 Departmental Core course (1st course in the department, small sized classes, 4 credits)
1 Dept. recommended BS course (3 credits)	1 Dept. recommended GE course (4 credits)
BS (Chemistry/Physics) laboratory (2 credits)	1 Dept. recommended BS course (3 credits)
	BS (Physics/Chemistry) laboratory (2 credits)
Total: 17 Credits + Language & Life Skills	**Total: 17 Credits**

Branch Change

CRC had originally recommended a complete removal of branch change. Complete removal of branch change reduces flexibility in choosing branches. (Branch change operates in 2 modes – CGPA based, and eligibility based on JEE-Adv-rank. Removal of branch change will remove both modes.) The current proposal retains the spirit of flexible pathways in the undergraduate program, and early exposure to the department, while at the same time retaining the option of branch change, by allowing branch-change at the end of Semester-1.

Branch change will be based on all courses which are awarded a letter grade in Semester-1. In the proposed curriculum, the courses taken by all students are not the same. If felt necessary, a procedure for normalization of grades in different courses to bring all students on the same scale (along the lines adopted by GATE or other national level exams with multiple tests) will be adopted to execute the branch change. However, it is necessary to point out that several IITs operate branch change in the presence of non-uniform courses. It is noteworthy that IIT Delhi, till 2013, used to operate branch change in the presence of non-uniform courses.

To be eligible for CGPA-based branch change, a student must have,

a) successfully completed all courses including language and life-skills,
b) obtained a minimum SGPA of 8.0 in all courses (GE/OBC/EWS) or 7.0 in all courses (SC/ST/PH),
c) have no disciplinary action against him/her.

Branch change based on eligibility as per JEE-adv-rank will not require any of the above conditions. A student needs to only have been eligible for admission to the desired branch at the time of admission to IIT Delhi. Such a branch change will be allowed only in case there is a vacancy (after CGPA-based branch change) in the desired branch and appropriate category as per sanctioned strength.

After branch change at the end of semester-1, the number of students in any branch may not exceed 115%, or fall below 85% of the sanctioned strength.

Comparison Table

Category	Current Norms	Proposed by CRC	Current Proposal
BS	24	24 - 26	24
GE	19 EAS + (7-15) (PL)	24	24
SSW	15 (HU only)	9 + 6	15 (at least 9 in HUL)

OC	10	6	9
DC/DE	66 – 80	72 - 78	68 ± 3
CEER	Included in DC/DE/EAS	6 - 8	Min. 3 included in DC/DE
ETT	Included in DC/DE	3 - 4	Min. 3 included in DC/DE
ES	2 (included in EAS)	5	5
Total	**148 – 158**	**155 - 166**	**145 ± 3**

It may appear the credit allocation for general engineering (which has subsumed EAS and PL courses) has been reduced from 26-34 to 24. However, please note that the GE basket is to be tailored by the department for its specific program.

It may also appear that the total credits have been reduced from the current norms. (i) At 54 hours per week, and 3 hours per week per credit, the average load for an undergraduate student has been set at 18 credits per semester. (ii) Also note that **it is proposed that auditing of courses for the student is allowed only over and above the minimum credit requirements**. Currently only B.Tech students are allowed up to 8 audited credits. The current proposal places B.Tech students at par with all others in the Institute. (iii) To ensure 1 credit reasonably utilizes 3 hours of student time, teaching assistant support is critical. By mandating that teaching assistants register for a course to account for Teaching Assistantship (TA) responsibility (details in the PG proposal below), they could be used more effectively to evaluate outside of class learning assessment. This is a purely administrative intervention to achieve two ends: introduces an element of accountability for TA responsibility, and **increase outside of class learning**. For lasting change however, a change of attitude of students, post-graduate TAs, and faculty members, regarding the role of TAing in post-graduate education is required.

Exit Policy

On completion of 34 credits (18 BS, 12 GE, 4 DC), students would be eligible for a Certificate of IIT Delhi. After completion of 72 credits (including 24 BS, 18 GE, DC 21), they become eligible for an Associate of IIT Delhi. After completion of 108 credits (including 24 BS, 24 GE and a minimum of 36 credits of DC/DE), they become eligible for an Intermediate Bachelor of Technology of IIT Delhi. If they complete 46 DC/DE credits, they are eligible for an Intermediate Bachelor of Technology Degree in the Discipline.

The following are the learning outcomes for each of the exit options.

An Intermediate Bachelor of Technology in the Discipline graduate will be able to

i. analyze, synthesize and communicate ideas.
ii. demonstrate scientific temperament, integrity, personal and professional responsibility, and respect for others.

iii. assist in problem-solving by applying underpinning technical and theoretical knowledge in their discipline

An Intermediate Bachelor of Technology of IIT Delhi graduate will be able to

i. analyze, synthesize and communicate ideas.
ii. demonstrate scientific temperament, integrity, personal and professional responsibility, and respect for others.
iii. assist in problem-solving by applying scientific and broad engineering knowledge

An Associate of IIT Delhi will be able to analyze and communicate ideas and apply scientific and engineering principles in a limited context.

A recipient of the Certificate of IITD will be able to communicate ideas and apply scientific principles within narrow parameters.

It is proposed that the current practice of awarding UG-Diploma on completion of 100 undergraduate credits as an exit policy be continued.

Dual Degree Program

Departments, if they so desire, can form a Dual Degree Program for JEE Advanced entry students to graduate with B.Tech and M.Tech. in five years. The program is to be designed using all features of the corresponding undergraduate and M.Tech. programs in the appropriate discipline. The UG final year BTP1/Capstone is to be removed. 6 OC/OE credits from the B.Tech or M.Tech. parts are to be removed. 6 Program-core category M.Tech. credits (that are considered foundational in nature and are covered in the B.Tech program) are also to be removed. Further, the DE requirement in the B.Tech part is to be reduced by 6 credits.

The learning outcomes for the dual degree program at IIT Delhi are the following. Graduates of these programs would be able to:

i. analyze, synthesize and communicate ideas.
ii. demonstrate scientific temperament, integrity, personal and professional responsibility, and respect for others.
iii. identify, analyze and solve challenging problems within and across disciplines.
iv. apply their analytical skills to other areas of knowledge and design sustainable solutions to issues important in our society ethically.
v. draw on their advanced knowledge in a specialized area in their professional careers or for further learning.

Advanced Standing for Undergraduate Students

The Institute offers Advanced Standing options to all undergraduate students to encourage them to pursue a Masters' degree at IIT Delhi starting from their fourth year of undergraduate studies. Current norms even allow students to pursue a higher degree in a department other than their parent undergraduate department. To be eligible, students require a 7.5 CGPA at the time of enrollment in the higher degree. On application, admission to the higher program is based on evaluation/interview by the receiving program. To take maximum advantage of the program, students need to apply at the end of their UG 3rd year, before the start of their UG 4th year. Students are required to apply before their graduation from the UG program.

The following are possible: (1) UG student in Department-X pursuing M.Tech./MSR in Department-X, (2) UG student in Department-X pursuing M.Tech./MSR in Department-Y.

i. UG student in Department-X pursuing M.Tech. in the same department: 6 credits from OE/OC are to be reduced, 6 credits to be reduced from DE requirement, 6 PC credits to be waived (identifying foundational MTech courses that cover material studied in BTech). BTP1/Capstone is to be waived.
ii. UG student in Department-X pursuing M.Tech. in Department-Y: The 5-credit M.Tech. corner-stone project is to be waived, since the student is gaining exposure to teamwork in the BTP1/Capstone project. 3 credits of PE may be waived to attract students into the program. All 6 credits from OE are waived. It is expected that the student would be using the 9 OC credits to study foundational undergraduate courses in Department-Y.

4. Proposal for Postgraduate Curriculum

4.1 Doctor of Philosophy

Curricular Principles

CRC suggested the following elements to be incorporated in the curriculum to realize the vision of the PhD and MSR programs:

(i) Strengthening the fundamentals in foundational subjects of the discipline.
(ii) Equipping the students with advanced domain-specific knowledge.
(iii) Preparing the students to critically read and analyse scientific/technical literature to identify new problems and examine the state-of-the-art solutions to various problems.
(iv) Training the students in identifying appropriate research methodology to best address a given problem.
(v) Written and oral communication skills for effective mentoring, dissemination of their work to experts and non-experts and public outreach.
(vi) Sensitizing the need for maintaining high ethical standards.

(vii) Interaction between IIT Delhi and industry, in disciplines with industrial relevance, to expose students to practical applications and applied research.

On this basis, the Institute learning outcomes of the doctoral program, and a curriculum to achieve them is proposed.

Institute Learning Outcomes of the Doctor of Philosophy Program

A PhD Graduate from IIT Delhi will be able to:

I) Learning Outcome 1: Independently hypothesize, formulate, and solve fundamental research problems with breadth and depth.

II) Learning Outcome 2: Effectively communicate ideas, and ethically utilize the transferable skills in a professional setting.

I) Assessment of Learning Outcome 1: Independently hypothesize, formulate, and solve fundamental research problems with breadth and depth

A. Coursework

- Minimum 6 credits of coursework for M.Tech. entry-level qualification
- Minimum 12 credits of coursework for M.Sc./2-year PG Diploma/MBA/MBBS entry-level qualifications
- Minimum of 20 credits of coursework for B.Tech./B.E. entry-level qualification
- The existing requirement of a minimum B- grade in all registered courses is removed; the requirement of minimum CGPA/DGPA of 7.5 to continue PhD studies would continue. If in any semester a student gets less than 7 SGPA, the student will be awarded a U grade.

B. Comprehensive Examination

The comprehensive examination is expected to test students' comprehension of their broad field of research and their academic preparation and potential to carry out the proposed research plan. The comprehensive examination is recommended to be a combination of written and oral examinations, and should be separately conducted before evaluation of the research proposal.

An Academic Unit (AU) may choose from one or both of the two options below.

- Option 1: Written comprehensive test conducted by the AURC; this test would be conducted at least once a semester.

- Option 2: Written comprehensive test prepared by the SRC of the student, as per the finalized syllabus.

If a student has already demonstrated proficiency in courses (minimum three courses, 9 credits) that cover his/her broad field of research and if the AU permits, the SRC and DRC may recommend to waive the requirements of the written comprehensive examination.

AUs may decide whether, and how, the oral comprehensive examination is conducted. Students have at most two attempts to clear the comprehensive examination (considering both written and oral parts).

C. Research Plan Presentation

- Upon passing the comprehensive exam, the student must present the research plan to the SRC.

- Students can present the research plan a maximum of two times.

- Full-time students with Masters degree as entry-level qualification must present their research plan within 18 months of entry into the PhD program, whereas full-time students with Bachelors degree as entry-level qualification and part-time students may do so within 24 months.

For PhD Candidature, all these three components – coursework, comprehensive examination and research plan presentation, need to be successfully completed.

D. Progress Monitoring Presentations

- The student will give a progress presentation annually to the SRC. The supervisor will award the satisfactory or unsatisfactory grade every semester.

- In case the supervisor wishes to award an unsatisfactory grade, a presentation by the student must be held before the SRC, after which explicit concurrence of all SRC members is required for awarding of an unsatisfactory grade.

- Two consecutive U grades or a total of three U grades will lead to de-registration from the PhD program. Two U grades separated by a semester break will be counted as consecutive U grades. The CGPA/DGPA criteria to de-register from PhD will be continued.

E. Thesis Evaluation and Defense

- A list of 8 experts from reputed universities/research laboratories in India or abroad, be proposed by DRC/CRC/ScRC.
- Thesis will be evaluated by two external experts identified by the Dean, Academics. The supervisor will not be an examiner of the thesis.
- Supervisor is expected to submit his/her report of the thesis indicating its strengths and weaknesses, at the time of thesis submission.
- The thesis must be submitted preferably within six months, and no later than nine months of pre-PhD synopsis approval by AURC, failing which the pre-PhD synopsis must be repeated.

II. Assessment of Learning Outcome 2: Effectively communicate ideas, and ethically utilize the transferable skills in a professional setting

A. Teaching Practicum / Research Practicum

- AUs will float Teaching Practicum and Research Practicum as non-graded units for PhD Students with 1 unit in each semester. The courses will be graded as S/U. All Fulltime PhD Students must register for either course every semester. The grades in teaching/research practicum will reflect in the transcript of the student but will not affect academic progress. AUs may derive appropriate monthly assessment for this course and forward the same to the Academic Section in case assistantship is to be withheld.

B. Presentation at Symposia/Conferences and Pre-PhD/Synopsis

- Present their research work once in an academic year either at symposia conducted by the AUs or in national/ international workshops/ conferences/ schools.

C. Research Communication and Ethics

- The student will undergo mandatory training in research writing, oral communication skills, and research ethics specific to the discipline of AU. Course(s) graded pass/fail aimed at developing and enhancing written and oral research communication skills relevant to the research areas in the AU(s) will have to be offered by individual or collaborating AUs. No waiver for this course may be given to any student. [*The course may focus on basics of effective "academic" writing and speaking including structuring a journal article, critical review of literature, supporting arguments effectively, data presentation techniques, typesetting etc. Moreover, this course must sensitize the students about ethics in research and plagiarism. The students may also be given training in using plagiarism checking tools.]*

- The scientific communication requirements must be completed prior to the presentation of the research plan.

D. Research Empowerment

- Avail research fellowships, internships, secondments, research stays etc. in external (within India or abroad) Institutions, organizations, industries, NGOs etc., to obtain a broader understanding of the research topic and to advance the domain knowledge (A student may spend 4 weeks in this engagement, one time during the duration of PhD; after informing the Supervisor(s), AURC and the Dean, Academics. If it is exceeding four weeks, then necessary approvals from the Supervisor(s), AURC and the Dean, Academics, must be taken.

  OR

- Submit, present, and defend a research proposal removed from their thesis topic before the SRC/AURC. The proposal should display originality, breadth of interest, and soundness of training. The selection and formulation of the proposal will need to be defended.

- The research empowerment requirement must be completed prior to the submission of the synopsis.

Exit Policy

- Exit Degree: M.S. by Research in any academic unit. All AUs need to offer MSR degree in the new curriculum to facilitate this exit policy

- Eligibility for exit recommendation:

  - Exit option can be availed only with the recommendation of SRC on sufficient work done

  - Exit option can be availed only if a student is formally registered as a candidate for the Ph.D. Degree (Refer PhD Ordinance R 9.2 for the compliance of candidature)

- The Scholarship/Teaching Assistantship shall stop with immediate effect on approval of exit.

- Eligibility for exit degree:

  - The student must complete all the curriculum requirements for MSR, including a thesis, for the award of MSR degree

- Successful viva-voce examination after thesis submission within one year from the date of approval of Exit degree.

Other Recommendations:

- The present criteria adopted for conversion from M.Tech. to PhD would continue.
- The present constitution of the Student Research Committee (SRC) may continue. The SRC should preferably be constituted within a period of 3 months, and no later than 6 months, from the date of registration along with the appointment of a supervisor.
- It is recommended that the AUs float 800 level courses for the benefit of PhD students who have earlier graduated with a Masters degree and have already taken 700-level courses at IIT Delhi.
- Laboratory requirement: No specific laboratory requirement is being mandated. However, students are allowed to register for courses with P component. Even dedicated laboratory courses with 0-0-P structure will count towards the PhD course requirement.
- PhD students will be allowed to audit UG courses to help them strengthen basics in foundational subjects.
- A student shall be formally registered as a candidate for the Ph.D. Degree on completion of the following:
  - has successfully passed the courses registered
  - has passed the comprehensive examination.
  - has successfully defended a research plan, which is duly recommended by AURC, following approval by SRC

3.2 Master of Technology (M.Tech.)

The CRC Curriculum proposal states the following vision for the M.Tech. program. The main objective of the M.Tech. program is to train a specialized workforce for technological progress to meet societal needs. It is envisioned that M.Tech. graduates will be leaders in their core or allied areas and work as practitioners in industry and startups. M.Tech graduates are expected to apply the advanced knowledge in their disciplines to problems with immediate impact. Work in the industry will invariably require M.Tech. graduates to address problems with real-life applications and find solutions through well-executed projects. M.Tech. graduates of IIT Delhi are expected to maintain high ethical standards.

Curricular Principles

(i) Strengthening of fundamentals and exposure to advanced knowledge in the respective discipline.

(ii) Training in problem identification, project execution, effective communication, and documentation.
(iii) Equipping the students with an industry-relevant skill set.
(iv) Interaction with external stakeholders including industry, government agencies, and other academic institutions to understand real-life and industry-relevant problems.
(v) Embrace the UN Sustainable Development Goals (SDGs) as a holistic framework providing a context for delivery of the degree to appreciate the current and future needs of the society.
(vi) Sensitizing them to the need for maintaining high ethical standards.

The Institute learning outcomes that achieve the above vision of the M.Tech. program, and a curriculum to assess these outcomes is proposed.

Institute Learning Outcomes of the Master of Technology Program

A M.Tech. Graduate from IIT Delhi will be able to:

I) Learning Outcome 1: Apply advanced knowledge in a specialized discipline in preparation for their professional practice or further learning.

II) Learning Outcome 2: Effectively synthesize and communicate ideas, embrace teamwork and demonstrate scientific temperament, integrity, personal and professional responsibility.

I) Assessment of Learning Outcome 1: Apply advanced knowledge in a specialized discipline in preparation for their professional careers or further learning

Total Credits: The total credits of the M.Tech. program is 60 ± 3 credits. This includes 3 credits for the first summer semester minor project which is graded Pass/Fail, and those assigned for bridge courses, if any.

A. Program Core (PC) and Program Elective (PE)

- The AUs have flexibility to decide on the core and elective credits.
- It is recommended that some program core courses have mathematical grounding and exposure to laboratory (experimental or computational).
- It is recommended to integrate the concept of UN sustainable development goals and emerging trends relevant to the disciplines in the syllabi of a few core/elective courses.

- The M.Tech. coursework should be tuned towards current societal and market demands, with emphasis on high ethical standards.

B. Project/Thesis

- M.Tech. students will have to compulsorily undertake M.Tech. Project Part 1 (MTP1) in the 3rd semester. The minimum project grade requirements (C grade) will be discontinued.

- If the student secures a minimum criteria set by the AU, then she/he has an option to choose a course-intensive track with courses equivalent to MTP2. Else, the student will take MTP Part 2, project-intensive track. A student who is eligible for a project-intensive track can opt for a course-intensive track with the approval from AURC.

- AUs are encouraged to facilitate the students (based on their interest) to undertake MTP1 and MTP2 in industries, national laboratories, government agencies, other academic organizations, NGOs etc., without compromising the evaluation criteria.

- Those students who undertake both MTP1 and MTP2 courses will only be considered for different Dept./Institute awards related to MTP.

- AUs have the flexibility to decide the credits for M.Tech. project. Minimum 18 credits are required to qualify as a M.Tech. project. Maximum MTP credits may be kept at 30 credits. All project credits need not necessarily be part of the core.

C. Open Electives

- The M.Tech. programs must be structured to allow at least 6 credits of open elective courses. The open elective courses may include courses floated by the parent AU.

D. Audit

- The students are encouraged to audit courses in addition to the graduation requirements, to broaden their knowledge in the core and allied areas. A successfully audited course could serve as a prerequisite for elective (PE/OE) courses.

II. Assessment of Learning Outcome 2: Effectively synthesize and communicate ideas, embrace teamwork and demonstrate scientific temperament, integrity, personal and professional responsibility

A. Teaching Practicum / Research Practicum

AUs will float Teaching Practicum and Research Practicum as non-graded units for M.Tech. Students with 1 unit in each semester. The courses will be graded as S/U. All Fulltime M.Tech. Students must register for either course every semester. The grades in teaching/research practicum will reflect in the transcript of the student but will not affect academic progress. AUs may derive appropriate monthly assessment for this course and forward the same to the Academic Section in case teaching assistantship is to be withheld.

B. Minor Project

AUs must float a "Minor Project" of 3 credits, graded Pass/Fail, in the summer semester after the 2nd semester, to facilitate interaction of M.Tech. students with external stakeholders such as industry, national laboratories, government agencies, and other academic organizations. The grade awarded for the minor project may either be "P" or "F". (Note that a new grade "P" is being introduced into the system. Current grades such as S, X or NP do not satisfy the requirement. F in the course affects graduation.) This course may preferably be floated as an "Internship". AURCs need to approve the Internship. In case external engagement is not feasible, the project may be carried out in the Institute itself (with the approval of the AURC).

C. Cornerstone Project

AUs must float a "Cornerstone Project" of 4-5 credits, to facilitate teamwork and collaboration between the students. This introductory project will start in the winter vacation after the 1st semester and continue during the 2nd semester. The project must be designed to work in teams, to be trained in problem identification, project execution, effective communication, and impart interdisciplinary perspectives. Work/Assessment equivalent to 2 credits need to be finished by the end of the winter vacation.

D. Professional Ethics Course

AUs must either float a customized course, of at least one credit, on professional ethics or include suitable courses offered by other AUs (e. g., VEV739, VEV740, etc.) in the curriculum.

Exit Policy

Exit Degree: P. G. Diploma in the academic unit.

Eligibility for exit:

(i) Must have completed at least one year in the program

(ii) Must have successfully completed minimum 30 credits.
(iii) Exit option can be availed only with the recommendation of DRC on sufficient courses done and knowledge gained.
(iv) The Scholarship/Teaching Assistantship shall stop with immediate effect on approval of exit.

AUs may specify the mandatory courses, if any, for the exit diploma.

Other Recommendations:

- The present criteria adopted for conversion from M.Tech. to PhD to continue.
- The present criteria adopted for conversion from M.Tech. to MSR to continue.
- The minimum CGPA requirements for continuation of stipend/degree will continue.
- Part-time students may be given a waiver from NGUs

3.3 Master of Science (Research)

Curricular Principles

The curricular principles of MSR program are similar to that of the PhD program. A strong foundation in the discipline of study, advanced domain-specific knowledge in a topic, the ability to critically read, review, and analyze scientific/technical literature, training to identify and apply appropriate research methodology to solve a problem, opportunity to communicate ideas to a wide variety of audience; sensitized about maintaining high ethical standards, and exposure to practical applications and applied research, are the salient features of a thesis based educational program.

The proposed learning outcomes, and its assessment form the basis of the recommendation for the MSR curriculum.

Institute Learning Outcomes for the Master of Science by Research

A MSR Graduate from IIT Delhi will be able to:

I. Learning Outcome 1: Apply advanced knowledge and scholarship in a specialized area for their research and further learning.

II. Learning Outcome 2: Effectively communicate ideas, demonstrate a scientific temperament and ethically utilize transferable skills in their chosen profession.

I. Assessment of Learning Outcome 1: Apply advanced knowledge and scholarship in a specialized area for their research and further learning

Total Credits: Coursework of 15 credits, minor project of 3 credits, and thesis 42 credits.

A. Coursework

- Courses with only laboratory component (0-0-P) can also be taken to fulfill the coursework requirements, in addition to other courses with L-T-P structure. None of the above components should be allowed to be taken through self-study.
- Research credits will be 42.
- Overall CGPA requirement to be eligible for assistantship will remain 7.5.

B. Research Progress Monitoring

- The rules for constitution of SRC will be same as that for PhD students. SRC will be constituted within 3 months of entry to the MSR program.
- The student will give a progress presentation annually to the SRC, at the end of the first and second years, and if required in the subsequent years. The supervisor will award the satisfactory or unsatisfactory grade every semester. However, in case of unsatisfactory performance SRC meeting must be scheduled to award U grade. Two consecutive U grades will lead to de-registration from the MSR program.

C. Thesis Evaluation and Defense

- The SRC will recommend whether the progress is satisfactory for the submission of the final thesis during annual progress review meeting at the end of the second year.
- The current guidelines for thesis evaluation will continue.

II. Assessment of Learning Outcome 2: Effectively communicate ideas, demonstrate a scientific temperament and ethically utilize transferable skills in their chosen profession

A. Teaching Practicum / Research Practicum

AUs will float Teaching Practicum and Research Practicum as non-graded units for MSR Students with 1 unit in each semester. The courses will be graded as S/U. All Fulltime MSR Students must register for either course every semester. The grades in teaching/research practicum will reflect in the transcript of the student but will not affect academic progress. AUs may derive appropriate monthly assessment for this course and forward the same to the Academic Section in case teaching assistantship is to be withheld.

B. Minor Project

AUs must float a "Minor Project" of 3 credits, graded Pass/Fail, in the summer semester after the 2nd semester, to facilitate interaction of MSR students with external stakeholders such as industry, national laboratories, government agencies, and other academic organizations. The grade awarded for the minor project may either be "P" or "F". (Note that a new grade "P" is being introduced into the system. Current grades such as S, X or NP do not satisfy the requirement. F in the course affects graduation.) This course may preferably be floated as an "Internship". AURCs need to approve the Internship. In case external engagement is not feasible, the project may be carried out in the Institute itself (with the approval of the AURC).

C. Presentation at Symposia/Conferences

Once in an academic year either at symposia conducted by the AUs or in national/international workshops/conferences/schools.

D. Research Communication and Ethics

The student will undergo mandatory training in research writing, oral communication skills, and research ethics specific to the discipline of AU. Course(s) graded pass/fail aimed at developing and enhancing written and oral research communication skills relevant to the research areas in the AU(s) will have to be offered by individual or collaborating AUs. No waiver for this course may be given to any student.

Exit Policy

Exit Degree: P. G. Diploma in the academic unit.

Eligibility for exit:

(i) Must have completed at least one year in the program
(ii) Must have successfully completed minimum 30 credits.
(iii) Exit option can be availed only with the recommendation of DRC on sufficient courses done and knowledge gained.
(iv) The Scholarship/Teaching Assistantship shall stop with immediate effect on approval of exit.

The student must complete all the exit diploma requirements, specified by the AU which may include mandatory courses.

Other Recommendations:

- Courses with only laboratory component (0-0-P) can also be taken to fulfill the coursework requirements, in addition to other courses with L-T-P structure.
- M.Tech. to MSR will be allowed as per current rules.
- Conversion from MSR to M.Tech. is allowed, provided that the GATE score of the student is higher than the lowest GATE score of the corresponding MTech cohort in the category of the student, and the student would otherwise be eligible to be admitted into the MTech program. Minimum CGPA for the conversion is 8.0. Other existing criteria for conversion to remain.