PG Course Structure and Templates (From 2025-26 Sem I batch)

For details regarding the course structure and other details the students are requested to follow the PG manual (https://www.iitk.ac.in/doaa/ › PG students).

1. Coursework and Thesis Requirements (PG Programmes)

- For a full-time student, the normal semester load is defined as equivalent of 36 credits. For a well-merited case, the SPGC may permit a student to register for a maximum of 45 credits or a minimum of 27 credits.
- A full-time student is required to register in the summer term for up to a maximum of half the normal semester load.
- The course work credits listed here are minimum and students can credit more courses as per the norms specified in the PG manual. The thesis credits registered for in the summer term is not included in Table 1.
- In terms of the requirements: (i) B.S. in science (4 year) degree will be considered equivalent to M.Sc, (ii) B.S. in engineering (4 year) will be considered equivalent to B.Tech.

Table 1. Coursework and thesis requirements for M.Tech., M.S.(R), and Ph.D. programmes in Sustainable Energy Engineering

Program admitted to	Highest Degree qualified	Min. Course Credits	Min. Thesis Credits	Min. Total#	Scholarship period *	Minimum Duration	Maximum Duration**
M.Tech.	B.Tech.	72	72	144	22 months	4 semesters	4 years
	M.Sc.	72	72	144			
M.S. (R)	B.Tech.	54	90	144	22 months	4 semesters	4 years
	M.Sc.	54	90	144			
Ph.D.	B.Tech.	72	126	216	5 years	6 semesters	7 years
	M.Sc.	72	126	216		6 semesters	7 years
	M.Tech.	54	90	144		4 semesters	6 years

* Scholarship refers to financial assistance provided by MoE via the Institute. The period refers to the maximum period the full scholarship can be received. Other details can be found in the PG manual.

** For external students or part time students one additional year is added to the maximum duration.

#Minimum total credits must be satisfied for completion of degree.

1.1 Minimum Academic Requirements (Section 7.7 PG manual)

- The minimum CPI requirement for continuing in the programme or for graduation is as follows.
- M.Tech./M.S. by Research is 6.0 and that for the Ph.D. programme is 6.5.
- In the first semester in which the student registers, the minimum CPI (SPI) may be relaxed to 6.0 and the student may be allowed to continue in the following semester on the recommendations of the DPGC and with the approval of the SPGC. A letter of warning will be issued by the Head of the Department/IDP of the student.
- In subsequent semesters, if a M.Tech./M.S. by Research secures a CPI between 6.0 and 6.5 or a Ph.D. student secures a CPI between 6.5 and 7.0, he/she may be allowed to continue in the following semester on the recommendation of the DPGC and with the approval of the SPGC. A letter of warning will be issued by the Head of the Department/IDP of the student.

2. Course Requirements (M.Tech., M.S.(R), and Ph.D.)

- Students can take courses from the core basket in addition to the minimum requirement as the department elective. (Supervisor/DPGC is expected to give their advice on the matter, taking into account the background of the student).
- The courses are distributed over Semester I (odd) and II (even)

Table 2. Compulsory and elective courses in DSEE and other relevant courses for UG & PG students.

	Credits
A. SCHEME basket course (for UG students)	**L-T-P-C**
SEE-211: Energy, Climate Change and Sustainability [*Semester II*]	3-0-0-9
B. PG Core Basket (minimum 2 for M.Tech., M.S.(R), and Ph.D. students)	
SEE-601: Thermo-Fluid Engineering [*Semester I*]	3-0-0-9
SEE-602: Physics of Energy Materials [*Semester I*]	3-0-0-9
SEE-603: Electrical Power Engineering [*Semester I*]	3-0-0-9
SEE-609: Mathematical and Computational Tools for Engineering* [*Semester I*]	3-0-0-9
SEE-627: Electric Mobility [Semester I]	3-0-0-9
SEE-612: Manufacturing of Energy Systems [*Semester II*]	3-0-0-9
SEE-604: Thermodynamics of Energy Systems [*Semester II*]	3-0-0-9
SEE-617: Introduction to Sustainable Energy Policy [Semester II]	3-0-0-9
C. Compulsory (for all M.Tech., M.S.(R), and Ph.D. students)	
SEE-605: An Introduction to Sustainable Energy Technologies (with Laboratory) [*Semester II*]	2-0-3-9
SEE-801: Seminar Course I [both semesters]	0-0-0-0
SEE-802: Seminar Course II [both semesters]	0-0-0-0
D. Compulsory (only for Ph.D. students)	
SEE-888: Introduction to Profession and Communication [Semester I]	1-0-0-3
E. Department Electives	
SEE-606: Electrochemical Energy Systems	3-0-0-9
SEE-607: Hydrogen Energy: Production, Storage and Utilization	3-0-0-9
SEE-608: Introduction to Bioenergy and Biofuels	3-0-0-9
SEE-610: Introduction to Materials Modelling and Simulations$	3-0-0-9
SEE-611: Energy Systems: Modelling and Analysis	3-0-0-9
SEE 613: Solar Photovoltaics	3-0-0-9
SEE-614: Wind Energy	3-0-0-9
SEE-615: Solar Thermal Engineering	3-0-0-9
SEE-616: Renewables Integrated Smart Power Systems	3-0-0-9
SEE-618A: Energy Efficient Building Design	3-0-0-9
SEE-619: Finite Volume Methods for Engineers	3-0-0-9
SEE-620: Heat Driven Cooling Systems	3-0-0-9
SEE-621: Biomass Conversion and Biorefineries	3-0-0-9
SEE-622A: Sustainable Energy- Enabling Net Zero Emissions	3-0-0-9
SEE-623: Fuel Cell Electrical Energy Systems	3-0-0-9
SEE-624A: Design Strategies for Net-Zero Energy Buildings	3-0-0-9
SEE-625: Structural, Microstructural and Spectroscopic Characterization of Materials	3-0-0-9
SEE-626M: Ecological Principles and Biodiversity for Sustainability	3-0-0-5
SEE-628: Policy Processes and Analytical Methods: Application to Climate Policies	3-0-0-9
SEE-629M: Ecology, Equity and the Economy	3-0-0-5
SEE-631 Sustainable Forest Management	3-0-0-5
SEE-632: Heating, Ventilation, and Air-Conditioning of Buildings	3-0-0-9
SEE-633: Power Electronics for Electric Vehicles	3-0-0-9
SEE-634: Critical Material Resources for Clean Energy Transition	3-0-0-9

F. Open Electives	
EE679: Smart Grid Technologies	3-0-0-9
EE698B: Smart Grid Technology Applications	3-0-0-9

EE698E: Power Converters for EV Charging	3-0-0-9
EE662: Control Techniques in Power Electronics	3-0-0-9
EE698A: EMI/EMC in Power Electronics	3-0-0-9
EE798A: Design, Operation, and Control of Microgrids	3-0-0-9
EE630A: Simulations of Power Systems	3-0-0-9
EE660A: Basics of Power Electronic Converters	3-0-0-9
EE631A: Advanced Power System Stability	3-0-0-9
MSE673: Fundamentals and Applications of Electrochemistry	3-0-0-9
ME743: Fuel Cells	3-0-0-9
ME685A: Applied Numerical Methods*	3-0-0-9
AE603: Introduction to Scientific Computing*	3-0-0-9
CHE622A: Molecular Simulations[$]	3-0-0-9
CHE626A: Practical Introduction to Quantum Mechanical Methods for Scientists and Engineers[$]	3-0-0-9
CHE642A: Numerical Methods in Chemical Engineering*	3-0-0-9
MBA681A: Energy and Carbon Markets: Economics, Policy and Regulation	3-0-0-10
MBA782A: Renewable Energy - Economics, Policy and Regulation	3-0-0-5
MBA683A: Power Sector Reform and Regulation	3-0-0-10
Any other suitable elective in the Institute	3-0-0-9

*Students can take ONLY one of the following four: CHE642A, ME685A, AE603, SEE-609.

[$] Students can take ONLY one of the following three: SEE-610, CHE622A, and ChE626A.

Students can choose other electives from across the institute in consultation with their guide/DPGC. The following is a list of additional relevant electives offered by other departments.

2.1.1 Other Relevant Open Electives (subject to the changes)

- MSE604: Science and Technology of Thin Films and Device Fabrication
- MSE624A: Energy Materials and Applications
- MSE624A: Electronic Devices and Characterization
- MSE679: Optoelectronic Materials and Devices
- ME648A: Design of Thermal Systems
- ME613: Thermal Environmental Control
- ME639: Liquid-Vapour Phase Change Technologies
- ME742: Thermal Phase Change Systems
- EE662: Control Techniques in Power Electronics
- EE632: Economic Operation & Control of Power Systems
- MSE681A: Mathematics for Engineers
- AE603: Introduction to Scientific Computing
- AE602A: Mathematics for Aerospace Engg.

3. COURSE TEMPLATES

- The templates given below are as a guide to the student. The actual template *may* vary depending on other factors. Summer term registration is not shown in this section.
- Master's Students who wish (or are keeping the option open) to convert to a PhD programme, are requested to keep a note of this in view during exercising the choices.
- Students are strongly recommended to take more courses than the minimum requirement (especially in the first three semesters).

3.1 Typical Template for Minor Program in SEE-Table 3

3.2 Typical Template for M.Tech. (for both Regular and Dual-degree)

Table 4. A typical M.Tech. template. A detailed template can be found here.

Semester→ Year ↓	Odd	Even
1	36 Credits 1-2 from core basket [9-18] 2-3 Electives [0-27]	36 Credits 1 Compulsory: SEE 605 [9] 0-1 from core basket [0-9] 2-3 Electives [18-27]
2	36 Credits 4 Research units (SEE699)	36 Credits 4 Research units (SEE699)

- A student should take minimum **2** courses from the core basket.
- The electives should include at least 3DE's and the remaining OE'S.
- In addition, the students are recommended to register up to 18 thesis credits in the summer term.

3.3 Typical MS(R) Template (First 4 Semesters)

Table 5. A typical M.S. (R) template. A detailed template can be found here.

Semester→ Year ↓	Odd	Even
1	36 Credits 1-2 from core basket [9-18] 0-2 Electives [0-18] 0-2 Research Units (SEE899)	36 Credits 1 Compulsory: SEE 605 [9] 0-1 from core basket [0-9] 0-2 Electives [0-18] 0-2 Research Units (SEE899)
2	36 Credits 4 Research units (SEE899)	36 Credits 4 Research units (SEE899)

- A student should take **2** courses from the core basket.
- The electives should include at least 2DE's and the remaining OE'S.
- In addition, the students are recommended to register up to 18 thesis credits in the summer term.

3.4 Typical PhD Template (First 4 Semesters)

Students are strongly recommended to take more courses than the minimum requirement. A PhD student can credit extra courses depending on the requirement as suggested by his/her supervisor at any time in their programme.

Table 6. A typical Ph.D. template: for students with M.Tech. background. A detailed template can be found here.

Semester→ Year ↓	Odd	Even
1	39 Credits 1-2 from core basket* [9-18] 2-3 Electives# [18-27]	36 Credits 1 Compulsory: SEE 605 [9] 0-1 from core basket* [0-9] 2-3 Electives# [18-27] 0-2 Research Units (SEE799)
2	36 Credits 4 Research units (SEE799)	36 Credits 4 Research units (SEE799)

- A student should take 2 courses from the core basket.
- The electives should include at least 2DE's and the remaining OE'S.
- In addition, the students are recommended to register up to 18 thesis credits in the summer term.

Table 6. A typical Ph.D. template: for students with B.Tech./M.Sc. background. A detailed template can be found here.

Semester→ Year ↓	Odd	Even
1	39 Credits 1-2 from core basket* [9-18] 2-3 Electives# [18-27]	36 Credits 1 Compulsory: SEE 605 [9] 1-2 from core basket* [9-18] 0-2 Electives# [0-18] 0-2 Research Units (SEE799)
2	36 Credits 2 Research units (SEE799) 2 Electives# [18]	36 Credits 4 Research units (SEE799)

- A student should take 2 courses from the core basket.
- The electives should include at least 3DE's and the remaining OE'S.
- In addition, the students are recommended to register up to 18 thesis credits in the summer term.
- The minimum course credit requirement is 72 credits and minimum thesis credits requirement is 126 credits, however overall minimum total credit requirement is 216 credits.

4. Other Requirements/Duties during the PG Programmes

4.1 Teaching Assistant (TA) duty

PG Students on institute assistantship will have to perform 8 hours of TA work/week. The TA assignment will be allocated every semester by the DPGC.

4.2 Other Requirements towards the completion of PG degree

Only a brief outline is given here. Students are requested to consult the PG manual for more details.

4.2.1 Registration for regular semesters and the summer term

(Details in section 4 of the PG manual).

In every academic year during his/her programme, a student is required to register for ODD (I) semester, EVEN (II) semester and the Summer term for the courses/thesis credits that he/she intends to pursue in that semester/term.

4.2.2 M.Tech./BT-MT (Dual Degree) and M.S. (R)

- After completion of credits as per the programme requirements, the following requirements need to be completed by an M.Tech./BT-MT (Dual Degree) and M.S. (R)student (sections 8-11 PG manual).
  1. Thesis submission
  2. Oral Examination is to be conducted within four months from the date of submission of the thesis

4.2.3 Ph.D.

After completion of credits as per the programme requirements, the following requirements need to be completed by a Ph.D. student (sections 8-11 PG manual).

(i) Comprehensive examination.
(ii) The *Doctoral Monitoring Committee (DMC)* should be formed after the comprehensive exam.
(iii) State of the Art (SOTA) Seminar.
(iv) The *Peer Review Committee (PRC)* Should be formed for extension of scholarship beyond the 5th year.
(v) Open Seminar
(vi) Synopsis submission and Thesis submission

Oral Exams

- **Comprehensive exam.** Students registered in the Ph.D. programme must pass a comprehensive examination designed to test the overall comprehension of the student in the various subjects. A student can appear in the comprehensive examination only after he/she has completed the minimum course credit requirements and satisfied the minimum specified CPI requirement.
- **SOTA seminar.** Every Ph.D. student admitted to the candidacy for the Ph.D. degree is required to give a seminar in the Department covering the State of Art of the area of research. This seminar must be given within six months of passing the comprehensive examination. A report of satisfactory completion of this requirement is to be communicated to Chairperson, SPGC by the thesis supervisor through the Convener, DPGC.
- **Open Seminar.** Before proceeding to finalize the thesis, each Ph.D. student must deliver a seminar open to faculty and students in which the research work will be presented to obtain comments and criticism which may be incorporated in his/her thesis. A notice of the seminar must be displayed at least four days in advance. A thesis can be submitted only after the satisfactory fulfilment of this requirement. The intimation that the open seminar has been given should be communicated by the thesis supervisor through the Convener, DPGC to the Academic Section.

5. Conversion from M.Tech. and MS(R) degrees to PhD (section 4.6 PG manual)

Depending on their academic performance as prescribed in the PG Manual, a student registered for the M.Tech./M.S. by Research programme may be allowed to change his/her registration to the Ph.D. programme in Engineering.