VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI

Scheme of Teaching and Examinations (2026)

M. Tech., in Nanotechnology

(Specialization in Nanotechnology (INT) / Nano-Science and Technology (NST))

Choice-Based Credit System (CBCS) and Outcome-Based Education (OBE)

	I SEMESTER (Common to all specialized programmes under one stream)												
Sl. No	**Course Type**	**Course Code**	**Course Title**	**Teaching & Learning Scheme**					**Examination**				**Credits**
				CI		**LI**	**TW & SL**	**Total Hours/Sem**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
				L	**T**	**P**							
1	MAT/PCC	1MNT101	Mathematics	42	0	0	48	90	03	50	50	100	3
2	PCC	1MNT102	Introduction to Nano Technology	42	0	0	48	90	03	50	50	100	3
3	PCC	1MNT103	Materials Science and Properties of Nanomaterial	42	0	0	48	90	03	50	50	100	3
4	IPCC	1MNT104x	Integrated Professional core course	40	0	28	52	120	03	50	50	100	4
5	PEC	1MNT105x	Professional Elective Course-I	42	0	0	48	90	03	50	50	100	3
6	PEC	1MNT106x	Professional Elective Course-II	42	0	0	48	90	03	50	50	100	3
7	PCCL	MNTL107x	Professional Core Courses Lab (PCCL)	0	0	28	02	30	03	50	50	100	1
8	NCMC	MRMI108	Research Methodology and IPR (**Online**)		Online courses (online.vtu.ac.in)								PP
								TOTAL		**350**	**350**	**700**	**20**

Professional Elective Courses (PECs):

Professional Elective Courses – PEC–I and PEC–II – are common to all branches of specialization within a particular Engineering stream. Students may choose the most appropriate elective based on their field of specialization and academic requirements. *Note: The number of courses listed under each PEC group may exceed four, depending on the specializations under one stream.*

Integrated Professional Core Courses (IPCC):

The 1Mxx104x Group comprises specialization-specific core courses that are integrated with a practical component, ensuring application-oriented learning aligned with industry and research needs. The number of courses in the group depends on the number of specializations offered under a particular engineering stream.

Integrated Professional Core Course (IPCC)	
Code	**Title of the Course**
MNT104A	Characterisation Techniques for Nanomaterials characterization lab
MNT104B	Computational Nanotechnology & Simulation Lab
MNT104C	Energy Nanomaterials & Battery Technology Lab
MNT104D	Advanced Nanomaterials synthesis Lab

Professional Elective Courses-I	
Code	**Title of the Course**
MNT105A	Nanomaterials Synthesis & Processing
MNT105B	Nanoelectronics & Device Fabrication
MNT105C	Nanobiotechnology & Biosensors
MNT105D	Nanomaterials for Sensors & Actuators

Professional Elective Courses-II	
Code	**Title of the Course**
MNT106A	Advanced Thin Film Technology & Surface Engineering
MNT106B	Nanocomposites & Smart Materials
MNT106C	Nanotoxicology & Environmental Nanotechnology
MNT106D	Nano pharmaceuticals & Drug Delivery Systems

Professional Core Courses Lab (PCCL)	
MNTL107A	Nanomaterials Synthesis and Characterisation lab
MNTL107B	Nanoelectronics & Device Fabrication Lab
MNTL107C	Energy Nanomaterials & Electrochemical Characterisation Lab
MNTL107D	Nanobiotechnology & Biosensors Lab
MNTL107E	Thin Film Deposition, Lab

	Specialization in –(INT and NST)												
	II SEMESTER												
Sl. No	**Course**	**Course Code**	**Course Title**	**Teaching & Learning Scheme**					**Examination**				**Credits**
				L	**T**	**P**	**TW & SL**	**Total Hours /Semester**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
1	PCC/IPCC	1MNT201	Advanced 2D Nanomaterials	42	0	28	50	120	03	50	50	100	4
2	PCC	1MNT202	Semiconductor materials and Fabrication Technology	42	0	0	48	90	03	50	50	100	3
3	PCC	1MNT203	Quantum Materials	42	0	0	48	90	03	50	50	100	3
4	PCC	1MNT204	Design and Fabrication of Nano materials and Devices	42	0	0	48	90	03	50	50	100	3
5	PEC	1MNT205x	Professional Elective Courses-III	42	0	0	48	90	03	50	50	100	3
6	PEC	**1MNT206x**	Professional Elective Course-IV	42	0	0	48	90	03	50	50	100	3
7	PCCL	1MNTL207	Professional Core Course- Lab (AEC Lab)	0	00	28	02	30	03	50	50	100	1
8	PCC	MNTS208	Minor Project /Skill Development Project	0	0	56	04	60	03	50	50	100	2
									Total	**400**	**400**	**800**	**22**

About the Ability /Skill Development Project. Please see the pages 08 and 09

Professional Elective Courses (PECs)					
PEC-III			PEC-IV		
Code	Title of the Course		Code	Title of the Course	
MNT205A	MEMS & NEMS for Nanotechnology		MNT206A	Carbon Based Nanostructures	
MNT205B	Thin Film Technology & Surface Engineering		MNT206B	Nano materials for Energy Generation and Storage	
MNT205C	Perovskite Materials & Devices		MNT206C	Nanobiotechnology & Drug Delivery Systems	
MNT205D	Advanced Polymer Nanocomposites		MNT206D	Nanoelectronics, Spintronics & Quantum Devices	

Overview of Courses, Credits, Projects, and Internships under VTU Curriculum

I. Abbreviations used in the Scheme of Teaching and Examinations

Abbreviations	Expanded Form of the Abbreviations
AICTE	**All India Council of Technical Education**
NCrF	**National Credit Framework**
VTU	**Visvesvaraya Technological University**
AEC	Ability Enhancement Course
ASC	Applied Science Course
BSC	Basic Science Course
CIE	Continuous Internal Evaluation
CI	Classroom Instruction
CCA	Continuous Comprehensive Assessment
CGPA	Cumulative Grade Point Average
CUL	Cultural
COE	Centre for Online Education
HSMC	Humanities Studies and Management Course
IPCC	Integrated Professional Core Course
LI	Laboratory Instruction
L	Lecture
NCMC	Non-Credit Mandatory Course
NSS	National Service Scheme
NPTEL	National Programme for Technical Enhanced Learning
OEC	Open Elective (Interdepartmental or interdisciplinary) Course

PCC	Professional Core Course
PCCL	Professional Core Course Laboratory
PEC	Professional Elective Courses
PE	Physical Education
P	Practical
SEC	Skill Enhancement Courses
SEE	Semester End Evaluation
SL	Self-Learning
SGPA	Semester Grade Point Average
SWAYAM	Study Webs of Active-Learning for Young Aspiring Minds
TW	Term Work
T	Tutorial
VTU online	VTU online courses offered by Centre for Online Education,
YOG	Yoga

II. Credit Representation

1-hour Lecture (L) per week=1Credit

2-hoursTutorial(T) per week=1Credit

2-hours Practical / Drawing (P) per week=1Credit

Teaching & Learning Scheme
As per the new National Credit Framework (NCrF), 30 hours of learning of a student is considered equivalent to 1 credit. A semester is considered as a 14-week period of academic interaction with students. The learning components are categorized as follows:

1. Classroom Instruction (CI): Includes different instructional / implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts within the classroom measured in Number of hours per semester.
2. Laboratory Instruction (LI): Expressed as number of hours per semester which Includes experiments / practical performances / problem-based experiences in laboratory, workshop, field or other locations using different instructional / Implementation strategies.
3. Term work (TW): Includes assignments, seminars, presentations, case studies, micro projects, field activities, industrial visits, academic preparation duration and any other student activities in Number of hours per semester.
4. Self-Learning (SL): MOOCs (SWAYAM/NPTEL/Industry certified courses), spoken tutorials, online educational resources, self-initiated projects, Learning through digital resources etc in Number of hours per semester. (If provided in curriculum structure).

	Course Details	
1.	**One Credit Theory Courses:**	
	Teaching-Learning sessions in a semester	14 hours
	Examination pattern for CIE and SEE	Multiple Choice Question (MCQ)
	Teaching hours per week - L:T:P	1:0:0
2.	**One Credit Laboratory Courses:**	
	Teaching-Learning sessions in a semester	28 hours (2 hours session /week)
	Examination pattern for CIE and SEE	Continuous assessments, lab Internal test and SEE
	Teaching hours per week - L:T:P	0:0:2
3.	**Two Credit Theory Courses:**	
	Teaching-Learning Sessions in a semester	28 hours

	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week - L:T:P	2:0:0
4.	**Three Credit ESC/ETC/PCC/PEC/OEC Courses:**	
	Teaching-Learning Sessions in a semester	42 hours
	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week for theory courses - L:T:P	3:0:0
5.	**Four Credit Program Core Courses (PCC):**	
	Teaching-Learning Sessions in a semester	56 hours
	Examination pattern for CIE and SEE	Descriptive
	Teaching hours per week for theory courses - L:T:P	4:0:0
6.	**Four Credit Integrated Professional Core Courses (IPCC):**	
	Teaching-Learning Sessions in a semester (Teaching sessions: 42 hours + Practical sessions: 28 hours)	70 hours
	Examination pattern for CIE and SEE	Descriptive
	Practical part of examination	CIE (No SEE).
	Teaching hours per week - L: T: P	3: 0: 2

III. Details of Courses

(1) Integrated Professional Core Course (IPCC): The Integrated Professional Core Course (IPCC) refers to a core theory course that is integrated with a laboratory of the same subject. Each IPCC carries 4 credits, with Teaching–Learning hours structured (L : T : P) as either (3:0:2). The theory component of the IPCC shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). The laboratory part shall be assessed exclusively through CIE, with no SEE. However, questions derived from the laboratory part may be included in the SEE question paper to ensure comprehensive evaluation

(2) Non-Credit Mandatory Courses (NCMC): are aimed at enhancing students' knowledge, skills, and awareness beyond the core curriculum. Successful completion of the NCMC is compulsory for fulfilling the requirements of the academic program. It shall not be considered for the computation of SGPA, CGPA and vertical progression. Each student shall register for the prescribed NCMC(s) in the prescribed semester. A student who fails to qualify in the prescribed NCMC shall not be eligible for the conferment of the degree.

(3) Professional Elective Courses (PEC): A professional elective course (PEC) is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum of the same discipline.

(4) Open Elective Courses (OEC): A open elective course (OEC) is a course offered by departments other than a student's parent department. These interdepartmental /interdisciplinary courses allow students to explore disciplines beyond their core area of study. These courses are intended to promote interdisciplinary learning, broad-based education, thereby enhancing a student's overall knowledge, creativity, and employability. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor/Proctor.

(5) Ability Enhancement Course Laboratory (AEC): An Ability Enhancement Course Laboratory is a practical, skill-oriented lab course designed to strengthen students' practical abilities, professional competencies that support communication, environmental awareness, computational thinking, interdisciplinary learning, and application skills through hands-on learning experiences.

The laboratory may pertain to disciplinary or interdisciplinary involving experiments, design tasks, and mini-projects aligned with current industry practices.

(6) Skill Enhancement Courses (SEC): These courses are intended to develop specific practical skills and competencies that improve students' employability, technical proficiency, and professional readiness to bridge the gap between academic and industry requirements. These courses emphasize hands-on training, application of theoretical knowledge, and development of discipline-relevant and transferable skills required in industry and society, and develop entrepreneurship and start-up skills.

(7) Online Courses: Online courses are educational programs delivered over the Internet through a digital platform, allowing students to access lessons, assignments, and discussions from anywhere at any time. Most online courses offer flexibility, allowing students to access materials and complete assignments on their own schedule. However, students have to pass the course within a stipulated period as per the norms of the university.

(8) VTU Online Courses: VTU Online courses are online courses offered by Centre of Online Education (COE) Mysuru. A wide range of multidisciplinary courses are available to learners anywhere, anytime to earn university-prescribed credits through proctored examination for the award of a degree.

(9) NPTEL/SWAYAM Online Courses: The National Programme on Technology Enhanced Learning (NPTEL)/SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) are the specific Indian platforms to host national Massive Open Online Courses (MOOCs). It offers online courses on a wide range of disciplines to learners anywhere, anytime, to earn university-prescribed credits through proctored examination for the award of a degree. All NPTEL/SWAYAM courses are MOOCs, but not all MOOCs are offered on these specific Indian platforms.

IV. Ability Enhancement Project (AEP) / Skill Development Project (SDP)

An Ability Enhancement Project (AEP) or Skill Development Project (SDP) is a focused project aimed at enhancing specific skills or abilities in a particular domain. It's designed to bridge the gap between theoretical knowledge and practical application.

Key Objectives:

1. Develop practical skills relevant to the industry or field.
2. Enhance problem-solving, critical thinking, and analytical abilities.
3. Improve communication, teamwork, and collaboration skills.
4. Apply theoretical concepts to real-world problems or scenarios.
5. Foster creativity, innovation, and entrepreneurship.

Characteristics:

1. Practical and hands-on approach.
2. Industry-relevant skills and tools.
3. Mentorship and guidance.
4. Opportunity to work on real-world projects or case studies.
5. Emphasis on skill development and enhancement.