VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI

Scheme of Teaching and Examinations (2026)

M.Tech.(Quantum Technology)

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

I SEMESTER (Quantum Technology)

I SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching and Learning Scheme					Examination				Credits
					Classroom Instruction (CI) hours per semester		Laboratory Instruction (LI) hours Per semester	Term work s self -learning in hours	Teaching -Learning hours per semester = CI +LI+TW+SL	Duration in h ours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	TW+SL						
1	MAT/PCC	1MQT101	Mathematical Methods for Quantum Technologies		42	28	0	50	120	03	50	50	100	4
2	PCC	1MQT102	Principles of Quantum Mechanics		42	0	0	48	90	03	50	50	100	3
3	PCC	1MQT103	Classical and Quantum Information Theory		42	0	0	48	90	03	50	50	100	3
4	PCCL	1MQTL104	Programming for Quantum Technologies		0	0	56	04	60	03	50	50	100	2
5	PCCL	1MQTL105	Quantum Technologies Lab 1		0	0	56	04	60	03	50	50	100	2
6	IPCC	1MQTI106A	Integrated Professional Core Course - I		42	0	28	50	120	03	50	50	100	4
7	PEC	1MQTE107A	Professional Elective Course - I		28	0	0	32	60	03	50	50	100	2
8	NCMC	1MQT108	Research Methodology and IPR		Online course (online.vtu.ac.in)									PP
								Total	**600**				**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) - I	
Code	**Title of the Course**
1MQT106A	Quantum Optics
1MQT106B	Classical and Quantum-assisted machine learning.

Professional Elective Courses (PEC) - I	
Code	**Title of the Course**
1MQT107A	Solid State Physics
1MQT107B	Optical Communication

Specialization in (M.Tech Quantum Technology)

II SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching and Learning Scheme					Examination				Credits
					Classroom Instruction (Cl) hours per semester		Laboratory Instruction (LI) hours Per semester	Term work s self -learning in hours	Teaching -Learning hours per semester = Cl +LI+TW+SL	Duration in h ours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	TW+SL						
1	PCC	1MQT201	Introduction to Quantum Computation		42	0	0	48	90	03	50	50	100	3
2	PCC	1MQT202	Introduction to Quantum Materials		42	0	0	48	90	03	50	50	100	3
3	PCC	1MQT203	Introduction to Quantum Communication		42	0	0	48	90	03	50	50	100	3
4	PCC	1MQT204	Mini Project		0	0	0	240	240	03	100	100	200	8
5	PCCL	1MQT205	Quantum Technologies Lab 2		0	0	56	04	60	03	50	50	100	2
6	PEC - II	1MQTE206x	Professional Elective Courses (PEC) - II		42	0	0	48	90	03	50	50	100	3
								Total (In case of regular students)	**660**				**700**	**22**

***** 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.

Professional Elective Courses (PEC) - II	
Code	**Title of the Course**
1MQT206C	Optimization Problems
1MQT206B	Advanced Quantum Algorithms

Specialization in -(M.Tech Quantum Technology)

III SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching and Learning Scheme					Examination				Credits
					Classroom Instruction (CI) hours per semester		Laboratory Instruction (LI) hours Per semester	Term work s self -learning in hours	Teaching -Learning hours per semester = CI +LI+TW+SL	Duration in h ours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	TW+SL						
1	PCC	1MQT301	Industry Seminar		7	7	0	16	30	-	50	50	100	1
2	OEC	Open Elective	Open Elective		42	0	0	48	90	03	50	50	100	3
3	PCC	1MQT303	Major Project		0	0	0	360	360	03	100	100	200	12
4	PCC	1MQT304x	Professional Elective Courses (PEC) - III		28	0	0	32	60	03	50	50	100	2
Total (In case of regular students)									**540**				**500**	18

***** 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.

Professional Elective Courses (PEC) - III	
Code	**Title of the Course**
1MQT304A	Post Quantum Cryptography
1MQT304B	Quantum Sensing

Specialization in -(M.Tech Quantum Technology)

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching and Learning Scheme					Examination				Credits
					Classroom Instruction (CI) hours per semester		Laboratory Instruction (LI) hours Per semester	Term work s self -learning in hours	Teaching -Learning hours per semester = CI +LI+TW+SL	Duration in h ours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	TW+SL						
1	PI	1INT01	Internship (Research / Industry)		0	0	0	420	420	03	100	100	200	14
2	PEC	*1WS02	Professional Elective (Online Course)		0	0	0	90	90	03	50	50	100	3
3	OEC	*1WS03	Open Elective (Online course)		0	0	0	90	90	03	50	50	100	3
Total (In case of regular students)									**600**				**400**	**20**

* 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.

* Online courses must be completed in either the third or fourth semester.

Recommended Online NPTEL Courses

1. Optical Communication
2. Fundamentals of Nano and Quantum Photonics

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

(A) Abbreviations Adopted in the Scheme of Teaching and Examinations

Course		General Terms		General Terms	
Acronyms	**Expanded Form**	**Acronyms**	**Expanded Form**	**Acronyms**	**Expanded Form**
AEC	Ability Enhancement Course	AICTE	All India Council of Technical Education	SEE	Semester End Evaluation
ASC	Applied Science Course	CCA	Continuous Comprehensive Assessment	SGPA	Semester Grade Point Average
BSC	Basic Science Course	CGPA	Cumulative Grade Point Average	SL	Self-Learning
HSMC	Humanities Studies and Management Course	CI	Classroom Instruction	SWAYAM	Study Webs of Active-Learning for Young Aspiring Minds
IPCC	Integrated Professional Core Course	CIE	Continuous Internal Evaluation	T	Tutorial
NCMC	Non-Credit Mandatory Course	COE	Centre for Online Education	TW	Term Work
OEC	Open Elective	CUL	Cultural	VTU	Visvesvaraya
PCC	Professional Core Course	NCrF	National Credit Framework	VTU online	VTU online courses
PCCL	Professional Core Course	L	Lecture		
PEC	Professional Elective	LI	Laboratory Instruction		
PE	Physical Education	NPTEL	National Programme for		
SEC	Skill Enhancement	NSS	National Service Scheme		
YOG	Yoga	P	Practical		

(B) Academic Credit Framework in accordance with the National Credit Framework (NCrF)

The National Credit Framework (NCrF), introduced under India's education reforms, serves as an umbrella framework for the creditisation of learning across school education, higher education, vocational education, and experiential learning.

NCrF credit levels are determined based on a combination of cumulative years of learning, the complexity of learning outcomes, and the rigor of assessment. These levels signify the degree of competence and complexity attained by the learner, progressing from foundational schooling to advanced doctoral research.

Levels 1 to 4 correspond to school education up to the 12th standard, while Levels 4.5 to 8 correspond to higher education, ranging from the undergraduate level to the Ph.D. level.

In the earlier system, credits were primarily based on contact time (lecture hours per week × number of weeks per semester/year), assuming that learning is directly proportional to time spent in classroom instruction.

However, the NCrF adopts a comprehensive and outcome-based approach by assigning credits to all forms of learning, including, (i) Classroom teaching, (ii)Laboratory work, (iii)Projects, (iv)Internships and apprenticeships, (v)Online and blended learning, (vi)Fieldwork and community engagement, (vii)Recognition of Prior Learning (RPL), (viii)Sports and arts activities, and (ix)On-the-job training.

Credits are thus based on notional learning hours, representing the total learner effort rather than only contact hours.

This definition aligns Indian education with Global outcome-based credit systems, and international credit transfer practices [e.g., European Credit Transfer and Accumulation System (ECTS)-like frameworks].

According to NCrF, one academic year of learning is equal 1,200 notional learning hours (not a scientifically-validated law or psychological constant, but a policy design hours) and includes classroom teaching, self-study, assignments, projects, laboratory work, co-curricular and extra-curricular activities, internships, apprenticeships and other assessed learning experiences. For these 1,200 hours a student is expected to earn 40 credits, which means 1 credit corresponds to approximately 30 hours of academic learning.

Although traditional university systems often equated 1 credit with approximately 13 to15 contact hours per semester, VTU, in alignment with NCrF, considers 14-weeks of structured academic interaction per semester with students is equivalent to approximately 30 notional hours per credit.

The learning methodologies include:

(i) Classroom Instruction (CI): Includes different instructional/implementation strategies, such as 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.

(ii) 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.

(iii) 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.

(iv) 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).

VTU, in alignment with NCrF, considers 14-weeks of structured academic interaction per semester with students as equivalent to approximately 30 notional hours per credit.
Table below shows the credit structure, equivalent NCrF learning hours adopted by VTU:

Table 7.0.1 VTU adopted NCrF credit structure

Particulars	Classroom Instruction (CI) in Hours per semester		Laboratory Instruction (LI) in Hours per semester	Term work (TW) and Self-Learning (SL) in Hours per semester	Total number of Teaching-Learning hours per semester
	L	T	P	TW + SL	
1 Credit theory course	14	-	-	16	30
1 Credit Practical course	-	-	28	02	30
2 Credit theory course	28	-	-	32	60
3 Credit theory course	42	-	-	48	90
3 Credit theory course with Tutorial	28	28	-	34	90
4 Credit theory course	56	-	-	64	120
4 Credit theory course with Tutorial	42	28	-	50	120
4 Credit Integrated Course	42	-	28	50	120
Project work	-	-	-	As per the type of project	
Internship	-	-	-	As per the type of Internship	

NCrF is designed to work with ABC for years, where, credits are digitally stored to accumulate, transfer, and redemption across institutions for vertical and horizontal mobility across sectors, which is essential for MEME.

(C) 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/Skill 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 the Centre of Online Education (COE), Mysuru. A wide range of multidisciplinary courses is made available to learners anytime and anywhere, enabling them to earn University-prescribed credits through duly conducted proctored examinations for the award of the degree.

NPTEL/SWAYAM courses adopted by VTU shall be offered in accordance with the NPTEL/SWAYAM course delivery framework, wherein teaching–learning is carried out through the online MOOC platform, assignments are administered periodically, and assessment is completed through a centrally conducted proctored examination as prescribed by the respective platform.

(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.