Name of subject	**RESEARCH METHODOLOGY AND EXPERIMENTAL DESIGN (4 ECTS)**
Subject/module code	**ITMER1104**
Science taught semester (s).	1st semester
Responsible teacher	Compiled by J. Hamidov, Professor in the Department of General Technical Sciences at Jizzakh Polytechnic Institute, and O. Azizov, Associate Professor in the same department.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	**Total hours – 120 hours** **Contact hours – 36 hours** Lecture training hours – 18 hours Practical training hours – 18 hours **Independent education – 84 hours**
Course work	No
ECTS	4
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject is t**o develop master's students' reflective approach and sound thinking in scientific work, and enable them to integrate theory and practice when preparing a research program. **The objectives of teaching the subject** are to develop the ability to classify the sciences, use research methods effectively, select a research topic, identify relevant materials, study literature that strengthens research capability and apply acquired knowledge in practice. **Learning outcomes:** 1. Identify a scientific problem and formulate a research topic. Define the aim, objectives, object and subject of the investigation, and select and apply appropriate research methods. 2. Find, analyse and evaluate scientific sources. Analyse research results, draw scientific conclusions and use contemporary information and communication technologies. 3. Present research results in articles, conference abstracts, reports and other scientific formats. Observe academic integrity and research ethics, think independently, critically and creatively, and use contemporary technologies, including artificial intelligence, effectively and responsibly. 4. Formulate the research problem, topic, aim, objectives, object and subject. Develop a hypothesis, find and select scientific sources, analyse, compare and synthesise them, and select and apply methods appropriate to the research aim. 5. Collect, process and analyse empirical data. Present statistical results in tables, diagrams and graphs, interpret them and draw conclusions. Prepare scientific texts, citations and bibliographies, observe academic integrity and plagiarism prevention requirements, evaluate information critically, use digital tools and communicate results clearly, logically and with evidence in oral and written form.
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions).** Topics: 1. Science as a sociocultural phenomenon. Classification of the sciences 2. Creativity and scientific research as products of cognitive activity. Forms and types of scientific research 3. The relationship between a research problem and a problematic situation

	4. Scientific research methodology with artificial intelligence. Contemporary approaches and opportunities 5. Research schools, methods and methodological approaches in the systematic organisation of scientific activity 6. Intellectual property rights. Relationships between innovation, novelty, discovery, invention, intellectual property and patents 7. The professional development and social responsibility of researchers 8. Finding, collecting and processing scientific information. Research outputs and scientific writing 9. Social ethics in scientific research **II. Instructions and recommendations for organizing laboratory exercises** Laboratory work is not included in the curriculum **III. Practical training instructions and recommendations** The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints. *Recommended Practical Topics:* 1. Science as a sociocultural phenomenon 2. Classification of the sciences 3. Creativity and scientific research as products of cognitive activity. Forms of scientific research 4. The relationship between a research problem and a problematic situation 5. Research schools, methods and methodological approaches in the systematic organisation of scientific activity 6. Intellectual property rights. Relationships between innovation, novelty, discovery, invention, intellectual property and patents 7. Understanding and explanation as criteria of scientific activity 8. The influence of information and information technologies on research 9. Social ethics in scientific research **IV. Independent learning and independent work** Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form. Recommended topics for independent work: 1. Reviewing topic-related literature and selecting scientific information 2. Preparing a dissertation abstract 3. Preparing and presenting the dissertation introduction 4. Preparing a presentation on researchers' social responsibility and ethics 5. Major stages in the development of science 6. Innovations in contemporary science

	7. Researchers' views on the distinctive features of scientific development 8. Fundamental research and its role in social development 9. Relationships and differences between applied research and production 10. Types of creative activity 11. Heuristics as a new methodological approach 12. Nanotechnology as a discovery of the third millennium 13. Scientific enquiry and the concept of risk 14. The importance of symbols in scientific research 15. Major scientific concepts 16. Innovation policy, its aims, objectives, instruments and implementation areas 17. The concept, subject and object of scientific research 18. Theory of knowledge 19. Scientific research methods and their classification 20. The structure, writing process and presentation requirements of scientific work 21. Preparing the introduction to a scientific work 22. Preparing the conclusion to a scientific work 23. Preparing scientific work for its defence through the example of a dissertation synopsis 24. Science as a sociocultural phenomenon 25. Classification of the sciences 26. Forms of scientific research 27. Relationships between innovation, novelty, discovery and invention in research 28. The social and historical characteristics of research schools and how they function 29. Principal methodological approaches and principles 30. Problems and evidence as the starting points of scientific research 31. The importance of information and information technologies in scientific research 32. The professional and social responsibility of researchers 33. Corruption in the research community and methods and means of prevention
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline

	is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons; Preparing educational materials; Working with sources within the subject; Using educational technologies; Working in a team Preparing presentations; Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of “0-29,9” for

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<tr><td></td><td>these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of “0-29.9” for this type of control is considered to be an academic debtor.
Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.</td></tr>
<tr><td>Criteria for assessing student knowledge</td><td>
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<tr><th>5 grade</th><th>100 points</th><th></th><th>Assessment criteria</th></tr>
<tr><td>5</td><td>90-10</td><td>Excellent</td><td>When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.</td></tr>
<tr><td>4</td><td>70-89,9</td><td>Good</td><td>When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject</td></tr>
<tr><td>3</td><td>60-69,9</td><td>Satisfactory</td><td>When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.</td></tr>
<tr><td>2</td><td>0-59,9</td><td>Unsatisfactory</td><td>When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.</td></tr>
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<tr><td>Course assessment criteria and procedure</td><td>
<table>
<tr><th>Assessment type</th><th>Total points allocated</th><th>Control (task) form</th><th>Distribution of points</th><th>Qualifying score</th></tr>
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<tr><td rowspan="2">Current assessment</td><td rowspan="2">30 points</td><td>System tasks</td><td>20 points (divided by number of tasks)</td><td rowspan="2">18 points</td></tr>
<tr><td>Student activity (in seminars, practical, laboratory classes)</td><td>10 points</td></tr>
<tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: writing work</td><td>10 points</td><td rowspan="2">12 points</td></tr>
<tr><td>System tasks</td><td>10 points (divided by number of tasks)</td></tr>
<tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr>
</table>
* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.
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<tr><td>Recommended Literature</td><td>1. Shermuhamedova N. Ilmiy tadqiqot metodologiyasi. Toshkent, Fan va axborot texnologiyalar, 2014. 450 b.
2. Shermuhamedova N.A. Ilmiy tadqiqot metodologiyasi. Darslik. Toshkent, Axborot texnologiyalari, 2020. 454 b.
3. Shermuhamedova N.A. Ilmiy tadqiqot metodologiyasi. Darslik. Toshkent, Innovatsiya ziyo, 2021. 452 b.</td></tr>
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