# Karmaveer Bhaurao Patil University,

# Satara

## Syllabus for

## B. Sc. II Military Science

## Under

## Faculty of Science and Technology

## (As per NEP 2020 – NEP 2.0)

## With effect from Academic Year 2025-2026

## 1. STRUCTURE OF COURSE B.Sc. II

| Class | Level | Sem | DSC | | Minor | | OE | VSC | SEC | AEC | IKS | VEC | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T | P | T | P | | | | | | | |
| B.Sc. II | 5.5 | V | 4 (2 Theory Courses) | 2 (1 Practical Courses ) | 4 (2 Theory Courses) | 2 (1 Practical Courses ) | 2 | 2 (1 Practical Courses ) | 2 | 2 | 2 | - | 22 |
| | | VI | 4 (2 Theory Courses) | 2 (1 Practical Courses ) | 4 (2 Theory Courses) | 2 (2 Practical Courses ) | 2 | 2 (1 Practical Courses ) | 2 | 2 | - | 2 | 22 |

## 2. Evaluation Structure:

| Type | Credit | CCE | | | | ESE | Total |
|---|---|---|---|---|---|---|---|
| | | CCE - I | CCE-II | Mid-term | Total | | |
| Theory | 2 | 5 | 5 | 10 | 20 | 30 | 50 |

| Type | Credit | Journal | Viva | Students Performace | Exam | Total |
|---|---|---|---|---|---|---|
| Practical | 2 | 10 | 5 | 5 | 30 | 50 |

## 3. STRUCTURE OF COURSE B.Sc. II

| **Semester III** | | | | |
|---|---|---|---|---|
| **Sr. No.** | **Components** | **Course Code** | **Course** | **Credits** |
| 1 | Major | BNCCT231 | Fundamentals of Defence Micro-electronics | 02 |
| 2 | Major | BNCCT232 | Field Chemistry and Survival Techniques | 02 |
| 3 | Major Lab-III | BNCCP233 | Defence micro-electronics, Field Chemistry and Survival Techniques Lab | 02 |
| 4 | Minor I | - | DSC V | 02 |
| 5 | Minor II | - | DSC VI | 02 |
| 6 | Minor Lab I | - | DSP III | 02 |
| 7 | OE | BNCCTOE3 | Instrumentation Studies | 02 |
| 8 | VSC | BNCCPVSC1 | Military Musician | 02 |
| 9 | SEC | BNCCPSEC1 | Communication and Leadership Skills | 02 |
| 10 | AEC | BETAEC1 | English P-I | 02 |
| 11 | IKS | BNCCTIKS2 | Contribution of Military Science and NCC in Indian knowledge | 02 |
| | | | **Total** | **22** |
| **Semester IV** | | | | |
| **Sr. No.** | **Components** | **Course Code** | **Course** | **Credits** |
| 1 | Major | BNCCT241 | Computational Warfare Tools | 02 |
| 2 | Major | BNCCT242 | Strategic Numerical Computation | 02 |
| 3 | Major Lab IV | BNCCP243 | Computational Warfare Tools and Strategic Numerical Computation Lab | 02 |
| 4 | Minor | - | DSC VII | 02 |
| 5 | Minor | - | DSC VIII | 02 |
| 6 | Minor Lab | - | DSP IV | 02 |
| 7 | OE | BNCCTOE 4 | Environmental Studies | 02 |
| 8 | VSC | BNCCPVSC2 | Technical Writing and Documentation | 02 |
| 9 | SEC | BNCCPSEC2 | Ballistics and Armament Maintenance Skills | 02 |
| 10 | AEC | BNCCTAEC2 | English P-II | 02 |
| 11 | VEC | BNCCTVEC2 | Military Science for Environmental Awareness | 02 |
| | | | **Total** | **22** |
| **EXIT OPTION:** Award of UG Diploma in Major and Minor with **88 Credits** & an additional 4 credits core NSQF Course/ Internship OR Continue with Major & Minor | | | | |

**Abbreviations:**

OE: Generic/ Open Electives

VSEC: Vocational Skill and Skill Enhancement Courses

VSC: Vocational Skill Courses

SEC: Skill Enhancement Courses

AEC: Ability Enhancement Courses

IKS: Indian Knowledge System

VEC: Value Education Courses; FP: Field projects

CC: Co-curricular Courses; RM: Research Methodology; RP: Research Project

CEP: Community engagement and service; OJT: On Job Training: Internship/ Apprenticeship

| | |
|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** |
| | Yashavantrao Chavan Institute of Science, Satara |
| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - III |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| **Name of the Course: BNCCT231: Fundamental of Defence and Micro-Electronics** | |

**Course Objectives: Students Should be able to:**

1. Define and recall basic concepts of microcontrollers, logic gates, and circuit components used in defense systems.
2. Understand the working principles of embedded systems, analog-to-digital conversion, and timer circuits.
3. Study simple electronic circuits for military field use such as alarm systems and timing devices.
4. Learn and troubleshoot circuit behavior, optimize low-power designs, and interpret sensor data in tactical applications.

**Course Outcomes: Student will be able to:**

1. Identify and classify the components of microcontroller-based military gadgets.
2. Interpret and explain embedded system architecture relevant to field defense technology.
3. Design and develop basic functional circuits such as signal timers, LED systems, and perimeter alarms.
4. Evaluate circuit performance and recommend improvements for low-power military field applications.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module -1: Introduction to Microcontrollers and ICs**<br>Concept of embedded systems<br>Architecture of basic microcontrollers (like Arduino)<br>Inputs, outputs, and interfacing<br>Logic gates and military applications<br>Blinking LED demo project | **(08)** |
| **Module -2:** | **Module -2: Circuit Design for Portable Military Devices**<br>Low-power circuit strategies<br>Troubleshooting and circuit optimization<br>PCB design basics for small devices<br>Designing field gadgets<br>Creating alarm circuits for perimeter defense | **(08)** |
| **Module -3:** | **Module-3: Timing Devices and Frequency Generators**<br>Timers and oscillators basics (555 timer ICs) | **(07)** |

| | | |
|---|---|---|
| | Frequency generation for communication<br>Building basic buzzer circuits<br>Designing simple clock circuits<br>Experiment: setting up morse signal timers | |
| **Module -4:** | **Module -4: Data Acquisition and Processing Modules**<br>Basics of ADC (Analog to Digital Conversion)<br>Sensor data collection<br>Signal conditioning and noise reduction<br>Building a basic field weather station<br>Data logging using simple SD cards | **(07)** |

**Reference Books:**


1. The 8051 Microcontroller and Embedded Systems: Using Assembly and C. 2nd ed. New Delhi: Pearson Education India, 2009.
2. Gupta, Ankaj. Microcontroller and Embedded Systems. 2nd ed. New Delhi: S.K. Kataria & Sons, 2014.
3. Chandrakar, Saurabh, and Nilesh Bhaskarrao Bahadure. Microcontrollers and Embedded System Design. New Delhi: Wiley India, 2019.
4. Tripathi, Suman Lata, Parvej Ahmad Alvi, and Umashankar Subramaniam, Electrical and Electronic Devices, Circuits and Materials: Design and Applications. Boca Raton: CRC Press, 2021.
5. Kumar, Rakesh. GDI: Power & Area Efficient Digital Circuits for Portable Devices. Saarbrücken: LAP Lambert Academic Publishing, 2020.
6. Fahim, Amr M. Clock Generators for SOC Processors: Circuits and Architectures. Dordrecht: Springer, 2007.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

| | |
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| | Yashavantrao Chavan Institute of Science, Satara |
| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - III |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| **Name of the Course: BNCCT232: Field Chemistry and Servivel Techniques** | |

**Course Objectives: Students Should be able to:**

1. Understand the basic chemical principles of combustion, explosive reactions, and fuel efficiency relevant to military operations.
2. Learn methods of chemical water purification, hazardous substance detection, and decontamination in field settings.
3. Study the effectiveness of chemical preservatives, spoilage indicators, and survival ration preparation techniques.
4. Understand safety protocols and formulate field-ready solutions for water, fuel, and food safety using low-cost chemical techniques.

**Course Outcomes: Student will be able to:**

1. Explain key chemical processes involved in fuels, combustion, and field explosives.
2. Demonstrate field-based water purification, test kit preparation, and mini-explosive safety using basic chemical materials.
3. Assess contamination levels and hazardous substances using portable chemical indicators and rapid field methods.
4. Design survival kits, including safe food storage and chemical-based preservation systems, for real-world deployment.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module -1: Chemical Properties of Explosives and Fuels**<br>Combustion principles<br>Fuel efficiency and storage in field<br>Safe handling of field fuels and basic explosives<br>Chemical reaction rates and triggers<br>Demonstration of safe mini-explosives | **(07)** |
| **Module -2:** | **Module -2: Water Purification and Field Test Kits**<br>Methods of water contamination detection<br>Boiling, filtration, and chemical disinfection<br>Preparation of simple field test kits<br>Chemical indicators for potability<br>Setting up a basic water testing station | **(08)** |
| **Module -3:** | **Module-3: Detection of Hazardous Substances** | **(08)** |

| | | |
|---|---|---|
| | Gas detection in confined environments<br>Basic identification of biological and chemical threats<br>Simple paper and chemical tests<br>Safety protocols for first responders<br>Decontamination procedures | |
| **Module -4:** | **Module -4: Food Preservation and Survival Chemistry**<br>Basics of dehydration and salting<br>Use of chemical preservatives in survival rations<br>Field preparation of emergency ration kits<br>Chemistry of spoilage detection<br>Safe ration storage techniques | **(07)** |

**Reference Books:**


1. Deshpande, M. N. Elements of Explosives Engineering. Pune: Techknowledge Publications, 2020.
2. Jain, H. K., and A. R. Mitra. Basics of Fuel Combustion and Efficiency. New Delhi: Khanna Publishers, 2019.
3. Agrawal, Jai Prakash. *High Energy Materials: Propellants, Explosives and Pyrotechnics*. Hoboken: Wiley-VCH, 2010.
4. Jain, P. C., and Monika Jain. *Engineering Chemistry*. 16th ed. New Delhi: Dhanpat Rai Publishing, 2020.
5. Sharma, B. K. *Industrial Chemistry*. 36th ed. Meerut: Goel Publishing House, 2019.
6. Patnaik, Pradyot. *Handbook of Inorganic Chemicals*. New Delhi: Tata McGraw Hill, 2003.
7. Kulkarni, S. D., and G. R. Chatwal. *Engineering Chemistry*. 3rd ed. Mumbai: Himalaya Publishing House, 2018.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** | **From:** A. Y. 2025-26 |
| | **Name of the Course: BNCCP233: Defence micro-electronics, Field Chemistry and Survival Techniques Lab** | |

**Course Objectives: Students Should be able to:**

1. Remember the core components and functions of embedded systems.
2. Understand the architecture and logic of microcontrollers used in defense.
3. Apply practical methods of food preservation and ration chemistry.
4. Develop safety protocols and risk assessment strategies in chemical field environments.

**Course Outcomes: Student will be able to:**

1. Identify basic components in microcontroller systems.
2. Explain and develop circuit behavior in military device contexts.
3. Analyze water, air, and food for chemical and biological contamination.
4. Create low-cost, field-adapted solutions for fuel use, survival kits, and safety.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | List of Practicals:<br>1. LED Blinking Using Arduino<br>2. 555 Timer LED Flasher<br>3. Logic Gate Circuit (AND, OR, NOT)<br>4. Motion-Based Alarm System<br>5. ADC Read of Temperature Sensor<br>6. Sound/Buzzer Signal Generation<br>7. Low-Power LED Circuit<br>8. Miniature Field Weather Station<br>9. SD Card Data Logger<br>10. Troubleshooting & Optimization<br>11. Comparative Combustion of Solid vs Liquid Fuels<br>12. Preparation of Simple Field Water Filter<br>13. Turbidity Test and Alum Sedimentation<br>14. $KMnO_4$ Disinfection and Color Detection<br>15. Preparation of Turmeric/Beetroot pH Indicator Paper<br>16. Water Disinfection using Bleaching Powder<br>17. Preparation of Emergency Ration Kit<br>18. Detecting Acid/Base in Food Samples | (60) |

| | | |
|---|---|---|
| | 19. Field Safety Kit Simulation<br>20. Designing a Mini Water Testing Station | |

**Reference Books:**


1. The 8051 Microcontroller and Embedded Systems: Using Assembly and C. 2nd ed. New Delhi: Pearson Education India, 2009.
2. Gupta, Ankaj. Microcontroller and Embedded Systems. 2nd ed. New Delhi: S.K. Kataria & Sons, 2014.
3. Chandrakar, Saurabh, and Nilesh Bhaskarrao Bahadure. Microcontrollers and Embedded System Design. New Delhi: Wiley India, 2019.
4. Tripathi, Suman Lata, Parvej Ahmad Alvi, and Umashankar Subramaniam, Electrical and Electronic Devices, Circuits and Materials: Design and Applications. Boca Raton: CRC Press, 2021.
5. Deshpande, M. N. Elements of Explosives Engineering. Pune: Techknowledge Publications, 2020.
6. Jain, H. K., and A. R. Mitra. Basics of Fuel Combustion and Efficiency. New Delhi: Khanna Publishers, 2019.
7. Yadav, B. S. Analytical Techniques for Environmental Chemistry. Meerut: Pragati Prakashan,
8. Kulshreshtha, S. K. Environmental Chemistry: Air, Water, Soil Pollution. New Delhi: S. Chand Publishing, 2020.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions<br>(Two questions of 15 Marks each) |

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**Board of Studies in MILITARY SCIENCE**

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|---|---|
| **Programme:** B.Sc. | **Semester** - III |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |

**Name of the Course: BNCCT234: Basics of Defence Micro-electronics**

**Course Objectives: Students Should be able to:**

1. Define and recall basic concepts of microcontrollers, logic gates, and circuit components used in defense systems.
2. Understand the working principles of embedded systems, analog-to-digital conversion, and timer circuits.
3. Study simple electronic circuits for military field use such as alarm systems and timing devices.
4. Learn and troubleshoot circuit behavior, optimize low-power designs, and interpret sensor data in tactical applications.

**Course Outcomes: Student will be able to:**

1. Identify and describe basic embedded systems used in military electronics.
2. Design and build simple circuits for military applications, such as timers and sensors.
3. To analyze circuit behavior and troubleshoot basic microcontroller systems.
4. To apply low-power techniques in designing circuits suited for portable military devices.

| Module | Title and Contents: BNCCT234: Basics of Defence Micro-electronics | Hrs. |
|---|---|---|
| **Module -1:** | **Module -1: Introduction to Microcontrollers and Embedded Systems**<br>Overview of embedded systems in military applications<br>Basic microcontroller architectures (e.g., Arduino)<br>Inputs, outputs, and interfacing with external devices (e.g., sensors, actuators) | **(08)** |
| **Module -2:** | **Module -2: Logic Gates and Military Applications**<br>Basic logic gates (AND, OR, NOT, XOR)<br>Logic gates in military systems (e.g., control circuits, decision-making circuits)<br>Simple circuit design using logic gates | **(08)** |
| **Module -3:** | **Module-3: Timing Devices and applications**<br>Introduction to timers and oscillators (e.g., 555 timer IC)<br>Building basic buzzer circuits and clock circuits for tactical communication<br>Practical demo: Setting up a Morse code signal generator | **(07)** |
| **Module -4:** | **Module -4: Data Acquisition and Processing**<br>Basics of Analog-to-Digital Conversion (ADC)<br>Interfacing sensors (e.g., temperature, humidity) with microcontrollers<br>Simple data logging with SD cards and sensor-based weather station | **(07)** |

**Reference Books:**


1. Raj Kamal. Embedded Systems: Architecture, Programming, and Design. 3rd ed. New Delhi: McGraw Hill Education, 2017.
2. Gupta, U.A.B. Electronic Devices and Circuits. New Delhi: Dhanpat Rai Publications, 2012.
3. The 8051 Microcontroller and Embedded Systems: Using Assembly and C. 2nd ed. New Delhi: Pearson Education India, 2009.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILIATRY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCT235: Applied Survival Chemistry for Field Environments** | |

**Course Objectives: Students Should be able to:**

1. Understand the chemistry behind fuel use, water purification, and field safety.
2. Learn simple techniques for detecting contaminants and preserving food in emergency situations.
3. Study development of field-level water test kits and emergency survival rations.
4. Understand the chemical hazards and safety measures in confined environments.

**Course Outcomes: Student will be able to:**

1. Explain the basic chemical reactions relevant to field survival
2. Demonstrate basic water purification, test kit usage, and food preservation techniques.
3. Detect simple contaminants and hazards using improvised chemical indicators.
4. Apply safety practices for handling field chemicals and biological threats.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module -1 Field Fuels and Combustion Basics**<br>Types of common field fuels (kerosene, petrol, solid fuel tablets)<br>Simple combustion reaction principles<br>Fuel efficiency and storage precautions<br>Basic explosive vs. non-explosive materials (overview | **(08)** |
| **Module -2:** | **Module -2: Water Purification and Field Test Kits**<br>Introduction to water contamination types<br>Boiling, chemical disinfection (bleaching powder), and filtration<br>Use of $KMnO_4$, alum, and iodine tablets<br>Demonstration: Making a basic water test kit using strips/solutions | **(08)** |
| **Module -3:** | **Module-3: Hazard Detection and Field Decontamination**<br>Basic detection of chemical threats (smell, color change, indicators)<br>Role of litmus, turmeric, and paper-based tests<br>Use of masks and first responder protocols<br>Decontamination using soap, chlorine, and UV methods | **(07)** |
| **Module -4:** | **Module -4: Food Preservation for Survival**<br>Basics of spoilage and preservation: salting, sugar, dehydration<br>Use of safe chemical preservatives (citric acid, vinegar)<br>Packaging materials and field ration prep | **(07)** |

| | | |
|---|---|---|
| | Shelf-life estimation and storage guidelines | |

**Reference Books:**


1. Deshpande, M. N. Elements of Explosives Engineering. Pune: Techknowledge Publications, 2020.
2. Kulshreshtha, S. K. Environmental Chemistry: Air, Water, Soil Pollution. New Delhi: S. Chand Publishing, 2020.
3. Yadav, B. S. Analytical Techniques for Environmental Chemistry. Meerut: Pragati Prakashan, 2021.
4. Narayan, R. Handbook of Food Preservation Techniques. New Delhi: Himalaya Publishing House, 2018.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCP236: Basics of Defence micro-electronics, Applied Survival Chemistry for Field Environments Lab** | |

**Course Objectives: Students Should be able to:**

1. Understand basic logic and microcontroller I/O functions.
2. Learn simple circuit designs for military utilities.
3. Study basic water testing and food preservation techniques.
4. Understand natural indicators and simple materials for chemical detection

**Course Outcomes: Student will be able to:**

1. Describe the uses of sensors and timers.
2. Develop small circuits with real-world defense relevance.
3. Demonstrate the ability to prepare and apply simple, field-appropriate chemical solutions for water purification and preservation using locally available materials.
4. Design and evaluate a basic survival chemistry kit that addresses hydration, food preservation, and contamination detection during field operations.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **List of Practicals:**<br>1. LED Blink Code<br>2. Button-Controlled LED<br>3. Basic Logic Gate Demo<br>4. Simple Morse Code Blinker<br>5. IR Sensor Motion Trigger<br>6. 555 Timer-Based Buzzer<br>7. Potentiometer-Based ADC<br>8. Simulated Military Signal Device<br>9. Wire Break Alarm Circuit<br>10. Troubleshooting Practice<br>11. Making a Charcoal + Cotton Water Filter<br>12. Turmeric Indicator for Acidity Check<br>13. Disinfection of Water with Alum<br>14. Citric Acid and Vinegar as Preservatives<br>15. Use of $KMnO_4$ for Disinfection<br>16. Sugar + Salt Based Oral Rehydration Mix | (60) |

| | | |
|---|---|---|
| | 17. Drying and Storing Vegetables<br>18. Simple pH Testing of Field Water<br>19. Testing Contaminated vs Clean Water (Visual)<br>20. Group Project: Create Basic Survival Chemistry Kit | |

**Reference Books:**


1. Deshpande, M. N. Elements of Explosives Engineering. Pune: Tech knowledge Publications, 2020.
2. Kulshreshtha, S. K. Environmental Chemistry: Air, Water, Soil Pollution. New Delhi: S. Chand Publishing, 2020.
3. Yadav, B. S. Analytical Techniques for Environmental Chemistry. Meerut: Pragati Prakashan, 2021.
4. Narayan, R. Handbook of Food Preservation Techniques. New Delhi: Himalaya Publishing House,
5. Kulshreshtha, S. K. Environmental Chemistry: Air, Water, Soil Pollution. New Delhi: S. Chand Publishing, 2020.
6. Yadav, B. S. Analytical Techniques for Environmental Chemistry. Meerut: Pragati Prakashan,
7. Narayan, R. Handbook of Food Preservation Techniques. New Delhi: Himalaya Publishing House
8. Sharma, B. K. Industrial Chemistry Including Chemical Engineering. Meerut: Goel Publishing House, 2022.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions<br>(Two questions of 15 Marks each) |

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| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** OE | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTOE3: Instrumentation Studies** | |

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| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** VSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCPVSC1: Military Musician** | |

**Course Objectives: Students Should be able to:**

1. Understand the fundamentals of military music performance and practices.
2. Learn basic skills in handling, maintaining, and playing common military band instruments.
3. Understand military parade music, band drills, and musical commands.
4. Study basic skills in using software for music practice and notation

**Course Outcomes: Student will be able to:**

1. Explain the role of different instruments in a military band.
2. Perform basic drills and simple tunes using band instruments.
3. Differentiate between parade tunes, ceremonial calls, and commands.
4. Assess the quality of musical performance and group coordination.

| Section | Title and Contents | Hrs. |
|---|---|---|
| **Section -1:** | **List of Practicals:**<br>1. Introduction to bugle calls<br>2. Basic snare drum roll practice<br>3. Bass drum basic beat<br>4. Playing simple marches on bugle<br>5. Introduction to trumpet notes<br>6. Cymbals: Holding and crashing basics<br>7. Learning time signature with clap beats<br>8. Reading basic music notes (sheet practice)<br>9. Group marching with beat synchronization<br>10. Basic maintenance of bugle and trumpet<br>11. Assembly and handling of snare and bass drums<br>12. Simple two-line tune composition on MuseScore software<br>13. Sound level checking of different instruments using Sound Analyzer App<br>14. Conducting a mock parade with a beat<br>15. Practicing reveille and retreat calls<br>16. Synchronizing music with parade steps<br>17. Practicing volume control and tone quality<br>18. Group song and ceremonial practice<br>19. Using online tuners to fine-tune instruments | (60) |

| | | |
|---|---|---|
| | 20. Recording practice sessions and analyzing using software | |

**Reference Books:**


1. Surmani, Andrew. Essentials of Music Theory. Van Nuys, CA: Alfred Music.
2. Read, Gardner. Music Notation: A Manual of Modern Practice. New York: Schirmer.
3. Herbert, Trevor. Military Music: A History of Wind Bands. Oxford: Oxford University Press.
4. Terrell, Gordon L. The Bugler's Handbook. Available through online bookstores in India.
5. Riley, John. Basic Drum Technique and Beyond. Van Nuys, CA: Alfred Publishing,


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Attempt any three questions<br>(Three questions of 10 Marks) |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** SEC | **Marks:** 50 |
| | **Credits:** 1 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTSEC1: Communication and Leadership Skills** | |

**Course Objectives: Students Should be able to:**

1. Understand effective communication skills, both verbal and non-verbal, in high-pressure environments.
2. Learn enhancement of leadership and interpersonal skills required for military and civilian roles.
3. Learn the art of mastering public speaking, presentation skills, and conflict resolution strategies.
4. Learn the ability to lead teams and manage conflicts efficiently

**Course Outcomes: Student will be able to:**

1. Identify key communication strategies and leadership techniques.
2. Explain the role of communication in leadership and team management.
3. Demonstrate effective public speaking and conflict resolution in practical situations.
4. Assess communication styles and leadership strategies in real-world scenarios.

| Module | Title and Contents: | Hrs. |
|---|---|---|
| **Module -1:** | **Module -1: Communication Strategies in High-Pressure Environments**<br>**Introduction to Communication:**<br>Definition and importance of communication<br>Types of communication: Verbal, non-verbal, and written<br>Communication in military and civilian contexts<br>**High-Pressure Communication**<br>Dealing with high-pressure situations (e.g., wartime, emergencies)<br>Key strategies for clear and concise communication<br>Use of tone, body language, and language selection<br>**Barriers to Effective Communication**<br>Physical, psychological, and cultural barriers<br>Overcoming barriers in high-stress environments<br>**Practical Communication Techniques**<br>Active listening, paraphrasing, and feedback<br>Role of empathy in communication | **(07)** |
| **Module -2:** | **Module -2: Leadership and Interpersonal Skills**<br>**Leadership Styles**<br>Overview of different leadership styles (authoritarian, democratic, laissez-faire)<br>Choosing the right leadership style for the situation | **(08)** |

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|---|---|---|
| | **Team Leadership and Management**<br>Building and managing high-performance teams<br>Motivating and inspiring subordinates<br>Delegation and decision-making in leadership<br>**Conflict Resolution and Negotiation**<br>Conflict types: Task, relationship, process<br>Conflict management styles (avoidance, accommodation, competition, collaboration)<br>Negotiation strategies and techniques<br>**Public Speaking and Presentation Skills**<br>Preparing and delivering effective presentations<br>Overcoming stage fright<br>Engaging the audience and managing Q&A sessions | |

**Reference Books:**


1. Hughes, Robert L., Robert C. Ginnett, and Gary J. Curphy. Leadership: Enhancing the Lessons of Experience. 8th ed. New Delhi: McGraw-Hill, 2021.
2. Barker, Roger T., and Kenneth K. Gower. Interpersonal Communication: A Contextual Approach. 4th ed. New Delhi: Pearson Education, 2018.
3. Barker, G., and R. Knight. Leading Teams: Setting the Stage for Great Performances. New Delhi: Tata McGraw-Hill, 2017.
4. Fisher, Roger, William Ury, and Bruce Patton. Getting to Yes: Negotiating Agreement Without Giving In. New Delhi: Penguin Books, 2011.
5. Bovee, Courtland L., John V. Thill, and David K. Schatzman. Business Communication Today. 13th ed. New Delhi: Pearson Education, 2017.
6. Goleman, Daniel. Emotional Intelligence: Why It Can Matter More Than IQ. New Delhi: Bloomsbury Publishing, 2006.
7. Wright, Donald L. Communicating in Groups: Applications and Skills. 8th ed. New Delhi: Tata McGraw-Hill, 2018.


**Evaluation Pattern:**

**Total Marks: 25**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Note: Conversion of 20 marks of internal evaluation to 10 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any four questions (Five questions of 5 Marks)<br>• Note: Conversion of 30 marks of ESE evaluation to 15 Marks |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** SEC | **Marks:** 50 |
| | **Credits:** 1 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCPSEC1: Communication and Leadership Skills** | |

**Course Objectives: Students Should be able to:**

1. Understand effective communication skills, both verbal and non-verbal, in high-pressure environments.
2. Learn enhancement of leadership and interpersonal skills required for military and civilian roles.
3. Learn the art of mastering public speaking, presentation skills, and conflict resolution strategies.
4. Learn the ability to lead teams and manage conflicts efficiently

**Course Outcomes: Student will be able to:**

1. Identify key communication strategies and leadership techniques.
2. Explain the role of communication in leadership and team management.
3. Demonstrate effective public speaking and conflict resolution in practical situations.
4. Assess communication styles and leadership strategies in real-world scenarios.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **List of Practicals:**<br>1. Communication Simulation: Practicing communication in high-pressure situations (e.g., mock military briefing)<br>2. Active Listening Exercise: Practice listening, paraphrasing, and feedback<br>3. Team Leadership Simulation: Managing a small group task under time constraints<br>4. Conflict Resolution Roleplay: Practicing conflict resolution in teams<br>5. Public Speaking Session: Delivering speeches on assigned topics<br>6. Negotiation Simulation: Roleplay in negotiation with peers<br>7. Team-building Activities: Problem-solving exercises for teams<br>8. Presentation Skills: Creating a presentation and presenting to the class<br>9. Interpersonal Communication Exercise: Practicing face-to-face communication in group settings<br>10. Peer Feedback and Self-Evaluation: Giving and receiving constructive feedback | **(30)** |

**Reference Books:**


1. Hughes, Robert L., Robert C. Ginnett, and Gary J. Curphy. Leadership: Enhancing the Lessons of Experience. 8th ed. New Delhi: McGraw-Hill, 2021.
2. Barker, Roger T., and Kenneth K. Gower. Interpersonal Communication: A Contextual Approach. 4th ed. New Delhi: Pearson Education, 2018.

3. Barker, G., and R. Knight. Leading Teams: Setting the Stage for Great Performances. New Delhi: Tata McGraw-Hill, 2017.
4. Fisher, Roger, William Ury, and Bruce Patton. Getting Yes: Negotiating Agreement Without Giving In. New Delhi: Penguin Books, 2011.
5. Bovee, Courtland L., John V. Thill, and David K. Schatzman. Business Communication Today. 13th ed. New Delhi: Pearson Education, 2017.
6. Goleman, Daniel. Emotional Intelligence: Why It Can Matter More Than IQ. New Delhi: Bloomsbury Publishing, 2006.
7. Wright, Donald L. Communicating in Groups: Applications and Skills. 8th ed. New Delhi: Tata McGraw-Hill, 2018.

**Evaluation Pattern:**

**Total Marks: 25**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks<br>• | • Attempt any two questions (one question of 15 Marks)<br>• Note: Conversion of 50 marks of ESE evaluation to 25 Marks |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** AEC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTAEC1: English P I** | |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - III |
| | **Type:** IKS | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTIKS2: Contribution of Military Science in Indian Knowledge** | |

**Course Objectives: Students Should be able to:**

1. Understand the concept, scope, and significance of traditional knowledge, especially in the context of indigenous and military science knowledge systems.
2. Learn the historical development and protection mechanisms of traditional and military knowledge in India and globally.
3. Study the influence of ancient Indian military strategies and traditions on contemporary military science
4. Understand traditional military knowledge to modern national security and defense challenges.

**Course Outcomes: Student will be able to:**

1. Define and explain traditional and indigenous knowledge systems and their characteristics.
2. Describe and distinguish the need for protecting traditional knowledge and its role in the global economy.
3. Identify, interpret, and critically examine the military science knowledge in ancient Indian texts and practices.
4. Compare traditional Indian military science with modern military strategies and applications.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Introduction to Traditional Knowledge**<br>**Define traditional knowledge:** Overview of its nature, characteristics, and scope.<br>**Importance of traditional knowledge:** How it shapes cultural, social, and technological progress.<br>**Indigenous Knowledge (IK):** Key features and its role in local and global economies.<br>**Traditional Knowledge vs Western Knowledge:** Comparison and contrast, identifying strengths and limitations. | **(07)** |
| **Module -2:** | **Module -2: Protection of Traditional Knowledge**<br>**The need for protecting traditional knowledge:** Understanding the threats to indigenous knowledge systems.<br>**Significance of protecting traditional knowledge:** Legal, cultural, and economic perspectives.<br>**Value of Traditional Knowledge in the global economy:** How traditional | **(08)** |

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|---|---|---|
| | knowledge impacts modern-day industries (e.g., pharmaceuticals, agriculture).<br>**Role of government in protecting Traditional Knowledge:** National and international frameworks like WIPO and UNESCO. | |
| **Module -3:** | **Module – 3: Introduction to Military Science Knowledge System**<br>Overview of Military Science Knowledge System<br>Military Knowledge in Ancient Indian Texts<br>Indian Military Traditions and Practices<br>Modern Integration of Military Science Knowledge | **(07)** |
| **Module -4:** | **Module –4: Future Prospects of Military Science Knowledge**<br>Emerging Trends in Military Science, Future of Defense Technologies, Military Science in the Context of Global Security, Role of Indian Military Science in Global Defense, Strategic and Policy Implications, Ethical Considerations in Future Military Science: | **(08)** |

**Reference Books:**


1. Bhukta, Anindya. Legal Protection for Traditional Knowledge: Towards a New Law for Indigenous Intellectual Property. Leeds: Emerald Publishing Limited, 2020.
2. Gupta, Anil K., and T. Prakash. Traditional Knowledge in Modern India: Preservation, Promotion, and Protection. New Delhi: Springer India, 2017.
3. Choudhury, Bhavna. Protection of Traditional Knowledge in India. Saarbrücken: LAP Lambert Academic Publishing, 2015.
4. Sinha, R. K. Traditional Knowledge: Intellectual Property Rights and Biodiversity. New Delhi: Media House, 2015.
5. Arya, Ravi Prakash. Dhanurveda: The Vedic Military Science. Delhi: Indian Books Centre, 2004.
6. Roy, Prashant. Military Science. New Delhi: RS Book World, 2022.
7. Bhattacharya, Abhijit. Artificial Intelligence in Military Operations. New Delhi: Pentagon Press.
8. Singh, Rajiv. Boundary Dispute Between India and China. New Delhi: Indian Books and Periodicals, 2020.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>• Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** |
| | Yashavantrao Chavan Institute of Science, Satara |
| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - IV |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| Name of the Course: **BNCCT241: Computational Warfare Tools** | |

**Course Objectives: Students Should be able to:**

1. Understand basic programming logic and control structures used in military computations.
2. Learn algorithmic thinking to solve field-based and tactical challenges.
3. Study sensor data and simulate basic tracking and prediction models.
4. understand simple user interfaces and tactical dashboards for combat simulations using open-source tools.

**Course Outcomes: Student will be able to:**

1. Develop pseudo-code and flowcharts to solve simple battlefield scenarios.
2. Design basic mobile-based apps and tactical calculators for field use.
3. Simulate target tracking systems and evaluate prediction accuracy using basic algorithms.
4. Construct visual tactical displays and basic GUIs using open-source software for combat modeling.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Introduction to Military Programming Logic**<br>Basic logic development (if-else, loops)<br>Algorithm writing for field conditions<br>Simple mobile app basics for navigation and signaling<br>Pseudo-code writing drills<br>Building a basic tactical calculator | **(07)** |
| **Module -2:** | **Module -2: Algorithms in Target Tracking Systems**<br>Basics of tracking algorithms<br>Prediction algorithms for moving targets<br>Sensor data analysis for target tracking<br>Simulating simple tracking scenarios<br>Testing with homemade moving target models | **(08)** |
| **Module -3:** | **Module – 3: GUI for Tactical Displays**<br>Introduction to user interfaces for battlefield gadgets<br>Designing simple tactical dashboards<br>Basics of graphic libraries (no coding required)<br>Displaying tactical maps and signals on screens<br>Hands-on with open-source tools | **(07)** |
| **Module -4:** | **Module –4: Simulating Combat Models and Strategies** | **(08)** |

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|---|---|---|
| | Basics of simulation,<br>Field operation simulation games<br>Mapping field assets in real time<br>Creating field mock-up strategies<br>Low-cost table-top war gaming | |

**Reference Books:**


1. Nair, Rajiv. Introduction to Programming Using Python for Defense Applications. New Delhi: Pentagon Press, 2022.
2. Sharma, S.K., and Ashok Arora. Computer Programming and Applications in Defense. New Delhi: Kalyani Publishers, 2021.
3. Singh, J.P. Basics of Algorithms and Flowcharts for Defense Simulations. Mumbai: Tech Knowledge Publications, 2020.
4. Chavan, Amit. Mobile Computing for Field Forces. Pune: Nirali Prakashan, 2019.
5. Tiwari, R.K., and Ritu Singh. Simulation and Modelling Techniques for Military Strategy. New Delhi: Discovery Publishing House, 2020.
6. Mohapatra, Durga. Visual Programming with Python and Tkinter. Hyderabad: Universities Press,


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>• Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCT242: Strategic Numerical Computation** | |

**Course Objectives: Students Should be able to:**

1. Understand various number systems, matrix methods, and trigonometric applications relevant to military field use.
2. Learn numerical computation techniques for rapid, calculator-free decision-making during operations.
3. Study terrain data, angles, and distances using coordinate systems, clinometers, and estimation methods.
4. Understand logical solutions such as flowcharts, decision trees, and encrypted codes using mathematical principles.

**Course Outcomes: Student will be able to:**

1. Convert between decimal, binary, and hexadecimal number systems for tactical communications and programming.
2. Estimate distances, ammunition needs, and terrain features using trigonometric and numerical methods in the field.
3. Solve location, navigation, and encryption problems using matrices and coordinate systems.
4. Design and optimize battlefield decisions using logical flowcharts, tactical models, and problem-solving tools.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Number Systems and Tactical Calculations**<br>Decimal, binary, and hexadecimal conversions<br>Quick battlefield calculations without calculators<br>Estimations for distance and ammunition supply<br>Simple coding in field operations<br>Practical exercises in unit conversions | **(07)** |
| **Module -2:** | **Module -2: Trigonometric Methods in Target Estimation**<br>Basic trigonometric ratios in range finding<br>Height and distance estimation using clinometers<br>Practical triangulation methods<br>Field angle measuring instruments<br>Rapid calculation techniques | **(08)** |
| **Module -3:** | **Module – 3: Matrices and Coordinate Systems for Mapping** | **(07)** |

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|---|---|---|
| | Introduction to matrices in navigation<br>Map grid references and coordinate plotting<br>Terrain analysis using matrix methods<br>Creating simple encrypted messages using matrices<br>Practical map reading and plotting drills | |
| **Module -4:** | **Module –4: Optimization and Logical Problem Solving in Combat**<br>Time-distance-velocity optimization<br>Resource allocation models<br>Mission planning through logical flowcharts<br>Simple decision trees for tactical choices<br>Field games and exercises for logical thinking | **(08)** |

**Reference Books:**


1. Kapoor, V. K. Operations Research: Quantitative Techniques for Management. New Delhi: Sultan Chand & Sons, 2022.
2. Grewal, B. S. Higher Engineering Mathematics. Delhi: Khanna Publishers, 2021.
3. Sinha, P. K. Computer Fundamentals. New Delhi: BPB Publications, 2021.
4. Kothari, D. P., and I. J. Nagrath. Basic Electrical and Electronics Engineering. New Delhi: McGraw-Hill Education, 2020.
5. Taneja, R. K. Military Mathematics and Applications. New Delhi: Alpha Publications, 2019.
6. Ramesh, A. Applied Mathematics for Defense Studies. Chennai: Allied Publishers, 2020.


**Evaluation Pattern:**

**Total Marks: 50**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Mid Semester Exam: 20 Marks: Subjective<br>• Note: Conversion of 40 marks of internal evaluation to 20 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any two questions (Three questions of 10 Marks)<br>• Question -3: Attempt any four questions (Five questions of 5 Marks)<br>• Note: Conversion of 50 marks of ESE evaluation to 30 Marks |

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|---|---|---|
| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCP243: Computational Warfare Tools and Strategic Numerical Computation Lab** | |

**Course Objectives: Students Should be able to:**

1. Understand basic programming logic and algorithm design for battlefield scenarios.
2. Learn writing and executing pseudo-code and mobile utilities for field use.
3. Study trigonometric methods for field estimation in tactical scenarios.
4. Understand terrain and navigation data using matrix methods for mapping and coordinates.

**Course Outcomes: Student will be able to:**

1. Write and demonstrate logic-based code for decision-making in simulated field conditions.
2. Build a basic tactical calculator using conditional and loop structures.
3. Apply trigonometric techniques for field measurements (height, distance) using clinometers and field tools
4. Use matrices and coordinates to navigate, plot maps, and encrypt tactical messages.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: List of Practical's**<br>1. Flowchart and Pseudo-code for Tactical Scenarios<br>2. Simple Tactical Calculator<br>3. Logic Simulation with Algorithm<br>4. Creating Navigation Assistant (Mock App)<br>5. Mobile Signaling App Simulation<br>6. Prediction Algorithm for Moving Target<br>7. Sensor Data Analysis (Mock Data)<br>8. Simulating Tracking Models with Toy Objects<br>9. Graphical Tactical Dashboard Design<br>10. Field Strategy Board Game<br>11. Convert decimal, binary, and hexadecimal systems manually for various tactical operations.<br>12. Practice quick field calculations for distance, time, and ammunition using mental math.<br>13. Measure angles in field scenarios using simple protractors or phone apps for triangulation.<br>14. Use clinometers and trigonometric ratios (tangent function) for height | **(60)** |

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| | estimation in the field.<br>15. Use grid paper and basic tools to plot map coordinates manually.<br>16. Encrypt and decrypt simple messages using 2x2 and 3x3 matrices.<br>17. Design a decision tree for optimizing troop movement or resource allocation.<br>18. Solve time-resource optimization problems using basic arithmetic models.<br>19. Using paper maps and basic GPS data, practice plotting and reading terrain features.<br>20. Use real-life scenarios (e.g., vehicle movement) to calculate time, speed, and distance for tactical decisions. | |

**Reference Books:**


1. Nair, Rajiv. Introduction to Programming Using Python for Defense Applications. New Delhi: Pentagon Press, 2022.
2. Sharma, S.K., and Ashok Arora. Computer Programming and Applications in Defense. New Delhi: Kalyani Publishers, 2021.
3. Singh, J.P. Basics of Algorithms and Flowcharts for Defense Simulations. Mumbai: Tech Knowledge Publications, 2020.
4. Tiwari, R.K., and Ritu Singh. Simulation and Modelling Techniques for Military Strategy. New Delhi: Discovery Publishing House, 2020.
5. Mohapatra, Durga. Visual Programming with Python and Tkinter. Hyderabad: Universities Press, 2021.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions<br>• (Two questions of 15 Marks each) |

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| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** |
| | Yashavantrao Chavan Institute of Science, Satara |
| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - IV |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| Name of the Course: **BNCCT244: Tactical Logic and Simulation Basics** | |

**Course Objectives: Students Should be able to:**

1. Understand basic logic-building techniques used in military and defense computing.
2. Learn fundamental simulation methods applicable to battlefield conditions.
3. Study low-resource tactical problem-solving through coding logic and flowcharts.
4. Understand hands-on, low-budget applications using open-source tools and simulations.

**Course Outcomes: Student will be able to:**

1. Explain the basic chemical reactions relevant to field survival
2. Develop basic logical flowcharts and pseudo-code for military field problems.
3. Simulate battlefield operations using structured logic and tactical models.
4. Design simple GUI layouts and mock tactical dashboards for data visualization.
5. Demonstrate understanding of basic tracking logic and communication signal flows.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Military Logic Fundamentals**<br>Introduction to logic in battlefield applications<br>Flowchart construction: conditional and loop statements<br>Pseudo-code drills for tactical problem-solving<br>Introduction to decision trees in combat context | **(07)** |
| **Module -2:** | **Module -2: Basic Tactical Algorithms**<br>Ammunition allocation logic<br>Movement prediction for enemy tracking<br>Sensor response mapping (non-programming based)<br>Manual algorithm writing for alert-based systems | **(08)** |
| **Module -3:** | **Module – 3: Simulations for Battlefield Scenarios**<br>Field operation simulation basics<br>Manual gaming and tabletop strategic simulations<br>Simple battle map grid design<br>Role-play based field communication and response systems | **(07)** |
| **Module -4:** | **Module –4: Tactical Interface and Dashboards**<br>Overview of battlefield GUI needs<br>Dashboard layout techniques (non-programming)<br>Visual representation of resources and terrain | **(08)** |

| | | |
|---|---|---|
| | Basics of open-source tools for creating static dashboards (e.g., Canva, PowerPoint, Draw.io) Simple decision trees for tactical choices<br>Field games and exercises for logical thinking | |

**Reference Books:**


1. Nair, Rajiv. Introduction to Programming Using Python for Defense Applications. New Delhi: Pentagon Press, 2022.
2. Singh, J.P. Basics of Algorithms and Flowcharts for Defense Simulations. Mumbai: Tech Knowledge Publications, 2020.
3. Sharma, S.K., and Ashok Arora. Computer Programming and Applications in Defense. New Delhi: Kalyani Publishers, 2021.
4. Tiwari, R.K., and Ritu Singh. Simulation and Modelling Techniques for Military Strategy. New Delhi: Discovery Publishing House, 2020.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions (one questions of 15 Marks)<br>• Section II: Attempt questions (one questions of 15 Marks) |

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| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** |
| | Yashavantrao Chavan Institute of Science, Satara |
| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - IV |
| **Type:** DSC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| Name of the Course: **BNCCT245: Tactical Mathematics and Field Estimation** | |

**Course Objectives: Students Should be able to:**

1. Understand Convert between number systems and perform rapid mental calculations.
2. Use trigonometric tools for height and distance estimation.
3. Apply basic matrices and coordinate plotting for map navigation.
4. Solve tactical problems using flowcharts and decision models.

**Course Outcomes: Student will be able to:**

1. Convert between number systems and perform rapid mental calculations.
2. Use trigonometric tools for height and distance estimation.
3. Apply basic matrices and coordinate plotting for map navigation.
4. Solve tactical problems using flowcharts and decision models.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Tactical Number Systems and Estimation**<br>Decimal, Binary & Hexadecimal basics<br>Mental math for battlefield scenarios<br>Ammunition/distance/time estimation drills<br>Unit conversions and quick multipliers | **(07)** |
| **Module -2:** | **Module -2: Trigonometry in the Field**<br>Angle of elevation/depression<br>Use of clinometers or phone-based angle meters<br>Height and distance estimation using sine and tangent<br>Field triangulation demo | **(08)** |
| **Module -3:** | **Module – 3: Matrices and Coordinates for Mapping**<br>Basics of 2×2 and 3×3 matrices<br>Use in encryption and message coding<br>Grid referencing and terrain mapping<br>Coordinate plotting activities | **(07)** |
| **Module -4:** | **Module –4: Logical Tactical Planning**<br>Decision trees and flowcharts for missions<br>Time-resource analysis using logical models<br>Simplified optimization scenarios<br>Field problem-solving games | **(08)** |

**Reference Books:**


1. Grewal, B. S. Higher Engineering Mathematics. Delhi: Khanna Publishers, 2021.
2. Kapoor, V. K. Operations Research. New Delhi: Sultan Chand, 2022.
3. Ramesh, A. Applied Mathematics for Defense Studies. Chennai: Allied Publishers, 2020.
4. Sharma, D. P. Military Field Mathematics. New Delhi: Pentagon Press, 2019.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions (one questions of 15 Marks)<br>• Section II: Attempt questions (one questions of 15 Marks) |

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| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** DSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCP246: Tactical Logic, Simulation Basics, Tactical Mathematics and Field Estimation Lab** | |

**Course Objectives: Students Should be able to:**

1. Understand structured approaches through flowcharts and pseudo-coding.
2. Learn combat situations using models and low-tech visual tools
3. Apply trigonometric methods for measuring distances, heights, and angles in the field.
4. Analyse basic coordinate systems for navigation and mapping.

**Course Outcomes: Student will be able to:**

1. Simulate basic battlefield communication and response using everyday objects
2. Construct mock dashboards and visual tracking models with available materials
3. Use trigonometric techniques for height, distance, and angle estimation in the field.
4. Apply basic coordinate plotting and navigation techniques in real-world scenarios.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: List of Practical's**<br>1. Tactical Flowchart Design<br>2. Pseudo-code for Ammunition Allocation<br>3. Signal Relay Simulation<br>4. Tracking a Moving Object<br>5. Resource Dashboard Design (Manual)<br>6. Simulated Evacuation Drill Logic<br>7. Battle Grid Simulation<br>8. Build a Paper-Based GUI<br>9. Terrain Mapping with Graph Sheets<br>10. Role-Play: Command Chain Simulation<br>11. Decimal ↔ Binary Conversion Game<br>12. Estimating Distance with Basic Geometry<br>13. Basic Angle Measurement<br>14. Mapping Coordinates<br>15. Trigonometric Estimation of Heights<br>16. Matrix Encryption Exercise<br>17. Map Plotting with Paper & Grid System<br>18. Simple Decision Tree Design | **(60)** |

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|---|---|---|
| | 19. Speed-Time-Distance Problems<br>20. Terrain Feature Analysis | |

**Reference Books:**


1. Nair, Rajiv. Introduction to Programming Using Python for Defense Applications. New Delhi: Pentagon Press, 2022.
2. Sharma, S.K., and Ashok Arora. Computer Programming and Applications in Defense. New Delhi: Kalyani Publishers, 2021.
3. Singh, J.P. Basics of Algorithms and Flowcharts for Defense Simulations. Mumbai: Tech Knowledge Publications, 2020.
4. Tiwari, R.K., and Ritu Singh. Simulation and Modelling Techniques for Military Strategy. New Delhi: Discovery Publishing House, 2020.
5. Mohapatra, Durga. Visual Programming with Python and Tkinter. Hyderabad: Universities Press, 2021.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Section I: Attempt questions<br>(Two questions of 15 Marks each) |

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| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** OE | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTOE4 Environmental Studies** | |

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| | **Karmaveer Bhaurao Patil University, Satara**<br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br>**Faculty of Science and Technology** | |
| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** VSC | **Marks:** 50 |
| | **Credits:** 2 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCPVSC2: Technical Writing and Documentation** | |

**Course Objectives: Students Should be able to:**

1. Understand how to write technical documents clearly, concisely, and precisely.
2. Learn standards, structure, and styles used in defense and scientific documentation.
3. Study skills in preparing manuals, reports, standard operating procedures (SOPs), and technical specifications.
4. Understand reviewing, editing, and formatting technical documents using modern tools.

**Course Outcomes:** Student should be able t

- **Course Outcomes:** Student will be able to...
  1. Recall key elements of technical writing and documentation standards.
  2. Explain the structure and styles of different technical documents.
  3. Develop simple manuals, reports, and SOPs.
  4. Evaluate and correct technical errors in sample documents.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | 1. Identifying elements of a technical report<br>2. Drafting a short SOP for a lab procedure<br>3. Writing a maintenance manual for a simple device (e.g., radio)<br>4. Editing a poorly written document<br>5. Formatting a technical report (headings, lists, tables)<br>6. Creating a table of contents and indexing in Word<br>7. Writing an executive summary for a technical report<br>8. Developing a datasheet for a communication device<br>9. Reviewing an SOP based on defense format (e.g., DRDO manual samples)<br>10. Using Grammarly for proofreading a technical paragraph<br>11. Comparing two versions of a technical manual and suggesting edits<br>12. Drafting a procedure for equipment calibration<br>13. Writing a basic proposal for a defense equipment purchase<br>14. Creating flowcharts for an operational SOP using Lucidchart (Free version)<br>15. Writing an incident report for equipment failure<br>16. Formatting a defense bulletin using Word Styles<br>17. Composing a technical article summary using Hemingway App<br>18. Preparing a simple Latex document for a technical report | **(07)** |

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| | 19. Drafting a system overview diagram using draw.<br>20. Collaborative documentation exercise using Google Docs | |

**Reference Books:**


1. Gerson, Sharon J., and Steven M. Gerson. Technical Communication: Process and Product. 9th ed. New Delhi: Pearson Education, 2017.
2. Brusaw, Charles T., Gerald J. Alred, and Walter E. Oliu. Handbook of Technical Writing. 11th ed. New Delhi: Macmillan, 2018.
3. Houp, Kenneth W., Thomas E. Pearsall, Elizabeth Tebeaux, and Sam Dragga. Reporting Technical Information. 14th ed. New Delhi: Oxford University Press, 2015.
4. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principles and Practice. 3rd ed. New Delhi: Oxford University Press, 2015.
5. Rutherfoord, John P. Basic Communication Skills for Technology. 2nd ed. New Delhi: Pearson Education, 2001.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Attempt any three questions<br>(Three questions of 10 Marks) |

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| | Yashavantrao Chavan Institute of Science, Satara | |
| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** SEC | **Marks: 25** |
| | **Credits:** 1 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCTSEC2: Ballistics and Armament Maintenance Skills** | |

**Course Objectives: Students Should be able to:**

1. Understand foundational knowledge and skills in the handling and maintenance of ballistic systems and armaments.
2. Learn different types of firearms, ammunition, and their maintenance protocols.
3. Study troubleshooting methods for common issues in ballistic systems.
4. Understand practical skills for ballistic performance analysis and effective armament servicing.

**Course Outcomes: Student will be able to:**

1. Identify the basic components of firearms and ammunition.
2. Explain the principles behind the functioning of firearms, ballistics, and armament maintenance.
3. Demonstrate the procedures for handling, servicing, and testing firearms and ammunition.
4. Assess the performance and maintenance needs of various types of ballistic systems.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: Introduction to Firearms and Ammunition Systems** Decimal, **Basics of Firearms**<br>Types of firearms: Rifles, pistols, shotguns, and machine guns<br>Components and working of firearms: Barrel, action, chamber, trigger mechanism<br>Safety protocols for handling firearms<br>**Ammunition Overview**<br>Types of ammunition: Ball, tracer, armor-piercing, etc.<br>Components of ammunition: Cartridge, primer, powder, bullet<br>Ammunition testing: Pressure testing, velocity, and reliability<br>**Basic Ballistics**<br>Internal, external, and terminal ballistics<br>Factors affecting ballistic performance: Barrel length, powder charge, bullet shape | **(07)** |
| **Module -2:** | **Module -2: Armament Maintenance and Troubleshooting**<br>**Firearm Maintenance**<br>Cleaning and lubricating firearms<br>Identifying and replacing worn-out components<br>Troubleshooting common issues: Misfires, jams, and wear<br>**Ballistic Performance Analysis** | **(08)** |

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| | Techniques for ballistic testing<br>Recording and analyzing test data<br>Interpreting results and making adjustments<br>**Maintenance Protocols**<br>Preventive maintenance schedules for firearms and ammunition<br>Documentation of repairs and servicing<br>Standard operating procedures (SOPs) for weapon maintenance | |

**Reference Books:**


1. Hatcher, Julian S. Hatcher's Notebook: A Complete Collection of the Notes and Knowledge of a Lifetime of Firearms Development and Maintenance. New Delhi: Navneet Publication, 2014.
2. Norton, R. L. Introduction to Firearm Maintenance. New Delhi: Tata McGraw-Hill, 2016.
3. Saul, W. E. The Science of Ballistics. New Delhi: Oxford University Press, 2017.
4. Goodwin, A. W. Firearm Technology and Weapon Maintenance. 2nd ed. New Delhi: Springer, 2018.
5. Murray, J. E. Ammunition Testing and Ballistics. New Delhi: Pearson Education, 2019.
6. Shaw, W. H. Weapons Maintenance and Firearm Servicing: Practical Insights. New Delhi: Wiley India, 2020.


**Evaluation Pattern:**

**Total Marks: 25**

| **Internal Continuous Evaluation (20 Marks):** | **End Semester Examination (30 Marks):** |
|---|---|
| • CCE - I : 10 Marks: Objective<br>• CCE - II: 10 Marks: Objective<br>• Note: Conversion of 20 marks of internal evaluation to 10 Marks | • Question -1: Solve the following questions (Five questions of 2 Marks)<br>• Question -2: Attempt any four questions (Five questions of 5 Marks)<br>• Note: Conversion of 30 marks of ESE evaluation to 15 Marks |

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| | **Board of Studies in MILITARY SCIENCE** | |
| | **Programme:** B.Sc. | **Semester** - IV |
| | **Type:** SEC | **Marks: 25** |
| | **Credits:** 1 | **From:** A. Y. 2025-26 |
| | Name of the Course: **BNCCPSEC2: Ballistics and Armament Maintenance Skills** | |

**Course Objectives: Students Should be able to:**

1. Understand foundational knowledge and skills in the handling and maintenance of ballistic systems and armaments.
2. Learn different types of firearms, ammunition, and their maintenance protocols.
3. Study troubleshooting methods for common issues in ballistic systems.
4. Understand practical skills for ballistic performance analysis and effective armament servicing.

**Course Outcomes: Student will be able to:**

1. Identify the basic components of firearms and ammunition.
2. Explain the principles behind the functioning of firearms, ballistics, and armament maintenance.
3. Demonstrate the procedures for handling, servicing, and testing firearms and ammunition.
4. Assess the performance and maintenance needs of various types of ballistic systems.

| Module | Title and Contents | Hrs. |
|---|---|---|
| **Module -1:** | **Module - 1: List of Practicals**<br>1. Firearm Disassembly and Reassembly: Students practice disassembling and reassembling a basic firearm.<br>2. Ammunition Testing: Testing different types of ammunition for pressure and velocity.<br>3. Weapon Cleaning and Lubrication: Hands-on cleaning and lubricating different firearms.<br>4. Troubleshooting Misfires: Identifying and correcting common misfire issues in firearms.<br>5. Ballistic Performance Testing: Measuring and recording velocity and accuracy of fired rounds.<br>6. Ammunition Loading and Safety Checks: Demonstrating proper techniques for loading and inspecting ammunition.<br>7. Firearm Safety Drill: Practicing safe handling procedures, aiming, and firing under controlled conditions.<br>8. Basic Firearm Troubleshooting: Identifying and fixing common firearm problems such as jams, feeding issues, or misfires.<br>9. Maintenance Record Keeping: Practicing documentation of firearm servicing, | **(60)** |

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| | including preventive maintenance.<br>Preventive Maintenance Schedule Creation: Developing maintenance schedules for different firearms. | |

**Reference Books:**


1. Hatcher, Julian S. Hatcher's Notebook: A Complete Collection of the Notes and Knowledge of a Lifetime of Firearms Development and Maintenance. New Delhi: Navneet Publication, 2014.
2. Norton, R. L. Introduction to Firearm Maintenance. New Delhi: Tata McGraw-Hill, 2016.
3. Saul, W. E. The Science of Ballistics. New Delhi: Oxford University Press, 2017.
4. Goodwin, A. W. Firearm Technology and Weapon Maintenance. 2nd ed. New Delhi: Springer, 2018.
5. Murray, J. E. Ammunition Testing and Ballistics. New Delhi: Pearson Education, 2019.
6. Shaw, W. H. Weapons Maintenance and Firearm Servicing: Practical Insights. New Delhi: Wiley India, 2020.
7. Hibbert, C. The History of Firearms: From Gunpowder to Automatic Weapons. New Delhi: Rupa Publications, 2021.


**Evaluation Pattern:**

**Total Marks: 50**

| **Journal, Students' Performance Viva, Project (20 Marks):** | **Practical Exam Paper (30 Marks):** |
|---|---|
| • Journa1: 10 Marks<br>• Students' Performance: 05 Marks<br>• Viva: 05 Marks | • Attempt any two questions<br>(Two questions of 10 Marks)<br>• Note: Conversion of 50 marks of ESE evaluation to 25 Marks |

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| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - IV |
| **Type:** AEC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| Name of the Course: **BNCCTAEC2: English P II** | |

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| | **Board of Studies in MILITARY SCIENCE** |
| **Programme:** B.Sc. | **Semester** - IV |
| **Type:** VEC | **Marks:** 50 |
| **Credits:** 2 | **From:** A. Y. 2025-26 |
| Name of the Course: **BNCCTVEC 2: Military Science for Environmental Awareness** | |

Coordinator
Military Science

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Science and Technology