Karmaveer Bhaurao Patil University,

Satara

Syllabus for

B. Sc. III Military Science

Under

Faculty of Science and Technology

(As per NEP 2020 – NEP 1.0)

With effect from Academic Year 2025-2026

1. STRUCTURE OF COURSE B.Sc. III

Class	Level	Sem	DSC		DSE		VSC	FP	CEP	OJT	Total
			T	P	T	P					
B.Sc. III	5.5	V	4 (2 Theory Cources)	4 (2 Practical Cources)	4 (2 Theory Cources Out of Four)	2 (1 Practical Cources)	4 (2 Practical Cources)	2	2	-	22
		VI	4 (2 Theory Cources)	4 (2 Practical Cources)	4 (2 Theory Cources Out of Four)	2 (2 Practical Cources)	2 (1 Practical Cources)	2	-	4	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. III

Semester V				
Sr. No.	**Components**	**Course Code**	**Course**	**Credits**
1	DSC	BNCCT351	Weapon Control and Automation Systems	02
2	DSC	BNCCT352	Directional Physics in Battlefield Deployment	02
3	Electives (Any one out of two)	BNCCT353	Weapon Training and Tactical Movements	02
		BNCCT353	Field Chemistry for Weapon and Ammunition Handling	02
4	Electives (Any one out of two)	BNCCT354	Mathematical Modelling in Combat Operations	02
		BNCCT354	Military Life Sciences: Survival and Medical Aid	02
5	DSC Lab	BNCCP355	Military Science Practical Lab – VII	02
6	DSC Lab	BNCCP355	Military Science Practical Lab – VIII	02
7	DSE Lab	BNCCP356	Military Science Elective Practical Lab – I	02
8	VSC	BNCCPVSC3	Military Field Communication Systems and Protocols	02
9	VSC	BNCCPVSC4	Intelligence Gathering and Reconnaissance Techniques	02
10	FP	BNCCFP1	-	02
11	CEP	BNCCTCEP1	Community Engagement Programme in Military Science	02
			Total	**22**
Semester VI				
Sr. No.	**Components**	**Course Code**	**Course**	**Credits**
1	DSC	BNCCT361	Advanced Target Detection Systems	02
2	DSC	BNCCT362	Warfare Communication Systems	02
3	Electives (Any one out of two)	BNCCT363	Field Craft and Battle Craft (FCBC)	02
		BNCCT363	Battlefield Energy Systems	02
4	Electives (Any one out of two)	BNCCT364	Tactical Computer Networks and Cyber Security	
		BNCCT364	Leadership and Discipline	02
5	DSC Lab	BNCCP365	Military Science Practical Lab – IX	02
6	DSC Lab	BNCCP365	Military Science Practical Lab – X	02
7	DSE Lab	BNCCP366	Military Science Elective Practical Lab – II	02

8	VSC	BNCCPVSC5	Technical Documentation and Communication for Military Applications	02
9	OJT	BNCCOJT	-	04
			Total	**22**

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

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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – V
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT351: Weapon Control and Automation Systems	

Course Objectives: Students should be able to:

1. Understand the fundamental principles of control systems used in military automation.
2. Learn knowledge of actuators and servomechanisms to analyze field-based weapon aiming and tracking systems.
3. Study remote weapon operation systems and communication protocols for defense applications.
4. Understand common faults and propose suitable troubleshooting or repair techniques

Course Outcomes: Student will be able to:

1. Explain the role of automation and control theory in modern military weapon systems and devices.
2. Demonstrate practical understanding of sensor-actuator integration using basic servomechanism setups.
3. Develop and simulate remote-controlled weapon operation systems using wired/wireless protocols.
4. Diagnose and rectify faults in a simulated military automation system through logical troubleshooting steps.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Principles of Automatic Control in Military Devices** Open loop vs Closed loop systems Sensors and feedback loops Control system elements (transducers, amplifiers) Stability concepts Field examples: gun turrets, UAV control	**(07)**
Module -2:	**Module -2: Actuators and Servomechanisms** Types: Hydraulic, Pneumatic, Electrical Motor control basics Servomotors for aiming mechanisms servo control techniques Simple motor-based field systems	**(08)**
Module -3:	**Module-3: Remote Weapon Operation Basics** Wired vs Wireless control systems Basics of remote triggering Communication protocols Example: Remote bomb disposal robots	**(07)**

	Hands-on simple RC model development	
Module -4:	**Module -4: Fault Detection and Rapid Repairs** Common field failures Redundancy techniques Trouble-shooting logic On-site emergency circuit fixes Simulation of faulty system repair	**(08)**

Reference Books:

1. Ogata, Katsuhiko. Modern Control Engineering. 5th ed. Delhi: Pearson Education India, 2011.
2. Nagrath, I.J., and M. Gopal. Control Systems Engineering. 6th ed. New Delhi: New Age International, 2018.
3. Kuo, Benjamin C., and Farid Golnaraghi. Automatic Control Systems. 9th ed. New Delhi: Wiley India Pvt. Ltd., 2014.
4. Bolton, W. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. 7th ed. Delhi: Pearson India, 2021.
5. Petruzella, Frank D. Programmable Logic Controllers. 4th ed. New Delhi: McGraw-Hill Education, 2017.
6. Tiwari, R. K. Fundamentals of Industrial Automation. New Delhi: S. Chand Publishing, 2022.

Evaluation Pattern:

Total Marks: 50

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

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Programme: B.Sc.	**Semester** – V
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCT352: Directional Physics in Battlefield Deployment	

Course Objectives: Students should be able to:

1. Understand the fundamental principles relevant to battlefield operations.
2. Study geometric and physical concepts in tactical scenarios.
3. Learn the performance and limitations of field navigation tools.
4. Understand simple, low-cost field instruments for deployment training

Course Outcomes: Student will be able to:

1. Demonstrate accurate use of magnetic and optical tools for battlefield positioning and directional planning.
2. Calculate positions, angles, and distances using basic geometry and triangulation in real or simulated field conditions.
3. Construct and calibrate simple navigational and thermal sensing devices for field deployment exercises.
4. Evaluate field environmental conditions that affect magnetic, optical, and thermal navigation accuracy.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Basics of Magnetic Navigation** Earth's magnetic field Use of compass and magnetic declination Mapping magnetic field interference zones Simple compass-making practicals Calibration techniques	**(07)**
Module -2:	**Module -2: Optical Methods for Positioning** Field of view calculations Range finding using optics Periscopic viewing systems Building basic periscopes Angle and sighting error experiments	**(08)**
Module -3:	**Module-3: Geometric Applications in Field Strategy** Triangulation for enemy location Area and distance calculations	**(07)**

	Practical drawing and field measurements Geometric error analysis Field plotting exercises	
Module -4:	**Module -4: Thermal Imaging and Field Detection** Basics of IR radiation Introduction to thermal cameras Low-budget IR sensor project setups Field exercises in night vision simulation Detecting heat sources in fields	**(08)**

Reference Books:

1. Duggal, Vijay Kumar. Elements of Geomatics. Hyderabad: Universities Press, 2013.
2. Sharma, R.K., and Shashi Bala. Modern Military Survey and Fieldcraft. New Delhi: Natraj Publishers, 2016.
3. Rajput, R.K. Applied Physics for Engineers. New Delhi: S. Chand Publishing, 2012.
4. Puri, R.K. Basics of Infrared Technology and Applications. New Delhi: Dhanpat Rai Publishing, 2015.
5. Nair, C.P. Military Map Reading and Field Sketching. New Delhi: Pointer Publishers, 2017.
6. Ministry of Defence (India). Military Engineering Field Manuals – Navigation and Surveying. Delhi: Directorate General of Military Training, 2020.

Evaluation Pattern:

Total Marks: 50

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	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – V
	Type: DSE	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT353: E-I Weapon Training and Tactical Movements	

Course Objectives: Students should be able to:

1. Understand the fundamental principles relevant to battlefield operations.
2. Study geometric and physical concepts in tactical scenarios.
3. Learn the performance and limitations of field navigation tools.
4. Understand simple, low-cost field instruments for deployment training.

Course Outcomes: Student will be able to:

1. Demonstrate accurate use of magnetic and optical tools for battlefield positioning and directional planning.
2. Calculate positions, angles, and distances using basic geometry and triangulation in real or simulated field conditions.
3. Construct and calibrate simple navigational and thermal sensing devices for field deployment exercises.
4. Evaluate field environmental conditions that affect magnetic, optical, and thermal navigation accuracy.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Basic Weapon Handling and Maintenance** Types of small arms Types of Infantry weapons Parts and working of Rifle (.22, INSAS, SLR, etc.) Safe handling procedures and protocols Strip and assemble drills Field practical with dummy rifles	**(07)**
Module -2:	**Module -2: Marksmanship and Firing Techniques** Fundamentals of shooting Aiming and sight picture Breathing and trigger control: Breathing techniques, Trigger control Firing positions, Scientific firing posture setups and benefits Weapon Cleaning, Maintenance, and Storage Range drill techniques, Zeroing and grouping,	**(08)**

	Simulation of firing positions	
Module -3:	**Module-3: Tactical Movements in Field** Individual field movement Fire and movement techniques Practical obstacle course drills Small unit tactics simulations	**(07)**
Module -4:	**Module -4: Basic Battle Formations and Manoeuvres** Squad and platoon formations Attack and defense manoeuvres Practical mock field exercises Field games for tactical movement	**(08)**

Reference Books:

1. Indian Army. Infantry Training Volume I: Weapon Training. New Delhi: Ministry of Defence, Government of India, Latest Edition.
2. Indian Army. Infantry Training Volume II: Tactical Exercises without Troops (TEWT). New Delhi: Ministry of Defence, Government of India, Latest Edition.
3. Hatcher, Julian S. Hatcher's Notebook: A Standard Reference for Shooters, Gunsmiths, Ballisticians, Historians, and Collectors. New Delhi: Navneet Publications, 2014.
4. Shaw, W. H. Weapons Maintenance and Firearm Servicing: Practical Insights. New Delhi: Wiley India, 2020.
5. Murray, J. E. Ammunition Testing and Ballistics. New Delhi: Pearson Education, 2019.
6. Hibbert, C. The History of Firearms: From Gunpowder to Automatic Weapons. New Delhi: Rupa Publications, 2021.
7. Fieldcraft School (India). Handbook on Tactical Movements and Fieldcraft for Cadets. Pune: Cadet Publications, 2020.
8. Sharma, D. K. NCC Cadet's Manual – Weapon Training and Field Craft. New Delhi: Jain Brothers, 2020.

Evaluation Pattern:

Total Marks: 50

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Programme: B.Sc.	**Semester** – V
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCT353: E-II Field Chemistry for Weapon and Ammunition Handling	

Course Objectives: Students should be able to:

1. Understand the chemical principles behind propellants, explosives, and chemical-based military agents.
2. Learn safe handling, storage, and disposal techniques for field-level chemical substances.
3. Study corrosion mechanisms in weapons and ammunition materials and evaluate anti-corrosion measures.
4. Understand field procedures for minor chemical experiments and simulate hazardous scenarios.

Course Outcomes: Student will be able to:

1. Explain the classifications, properties, and field applications of various explosives and propellants.
2. Perform simple, safe chemical simulations to understand smoke, gas, and incendiary weapon chemistry.
3. Assess material degradation in weapons through corrosion tests and suggest preventive actions.
4. Execute basic environmental and chemical safety protocols in simulated field scenarios.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Basics of Propellants and Explosives** Chemical properties of propellants Types of explosives and classifications Handling protocols Safe storage methods Simulating mini-reaction tests	**(07)**
Module -2:	**Module -2: Smoke, Incendiary, and Gas Weapon Chemistry** Mechanism of smoke grenades Basics of chemical fire production Gas generation and diffusion Safe practical demonstrations Field applications	**(08)**
Module -3:	**Module-3: Corrosion and Material Degradation in Weapons** Rusting and corrosion theory Prevention techniques Simple field tests for material integrity	**(07)**

	Demonstrations of electrochemical processes Anti-corrosion treatments	
Module -4:	**Module -4: Chemical Disposal and Environmental Safety** Handling chemical wastes Field decontamination techniques Neutralization methods Hands-on simulated chemical spill handling Environmental impact discussions	**(07)**

Reference Books:

1. Agrawal, Jai Prakash. High Energy Materials: Propellants, Explosives and Pyrotechnics. Singapore: Wiley-VCH, 2010.
2. Meyer, Rudolf. Explosives. 6th ed. Weinheim: Wiley-VCH, 2007.
3. Lee, J.R. The Chemistry of Explosives. 3rd ed. Cambridge: Royal Society of Chemistry, 2008.
4. Reniers, Genserik, and Kenneth Sörensen. Security and Safety in the Chemical and Process Industries. Amsterdam: Elsevier, 2013.
5. Jones, Frank. Corrosion and Corrosion Control. 4th ed. New Delhi: Wiley India, 2010.
6. Tchobanoglous, George, and Franklin L. Burton. Wastewater Engineering: Treatment and Reuse. 5th ed. New Delhi: McGraw-Hill Education, 2017.

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Total Marks: 50

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Programme: B.Sc.	**Semester** – V
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCT354 E-I: Mathematical Modelling in Combat Operations	

Course Objectives: Students should be able to:

1. Understand the fundamental principles of mathematical modeling and how they apply to combat scenarios and military planning.
2. Learn basic probability and risk assessment techniques to evaluate threat levels and operational uncertainties in combat simulations.
3. Study optimization problems related to military logistics, such as route selection and resource allocation.
4. Understand tactical data through statistical tools and graphs for better decision-making in field intelligence and operations.

Course Outcomes: Student will be able to:

1. Construct simple mathematical models for representing combat scenarios and resource movements.
2. Compute probability-based risk levels and threat probabilities for field decision-making.
3. Design and solve optimization models using graphical and logical methods in military logistics.
4. Interpret and present tactical field data through statistical analysis and modeling for command-level reporting.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Introduction to Mathematical Models in Warfare** Concept of modeling Force, motion, and resource models Basics of modeling with simple assumptions Examples from real-world defense systems Exercises on making simple models	**(07)**
Module -2:	**Module -2: Probability and Risk Assessment** Introduction to basic probability Risk and threat modeling Practical probability calculations Risk matrices for field operations Decision-making simulations	**(08)**
Module -3:	**Module-3: Optimization Techniques in Logistics** Shortest path and minimum time planning	**(07)**

	Resource allocation problems Graphical methods for solutions Field case studies Supply chain simulations	
Module -4:	**Module -4: Data Interpretation for Tactical Decision Making** Basic statistics (mean, median, mode) Graph plotting and interpretation Trend analysis Field survey design Report writing for tactical intelligence	**(08)**

Reference Books:

1. Taha, Hamdy A. Operations Research: An Introduction. 10th ed. New Delhi: Pearson Education India, 2017.
2. Sharma, J.K. Operations Research: Theory and Applications. 5th ed. New Delhi: Macmillan India, 2013.
3. Kapoor, V. K. Operations Research. New Delhi: Sultan Chand & Sons, 2022.
4. Spiegel, Murray R., Larry J. Stephens, and Narinder Kumar. Schaum's Outline of Statistics. 4th ed. New Delhi: McGraw Hill Education India, 2017.
5. Ross, Sheldon M. Introduction to Probability Models. 11th ed. New Delhi: Academic Press/Elsevier India, 2017.
6. Gupta, S.C., and V.K. Kapoor. Fundamentals of Mathematical Statistics. New Delhi: Sultan Chand & Sons, 2020.
7. Srinath, L.S. Operations Research: Principles and Applications. New Delhi: East West Press, 2018.

Evaluation Pattern:

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	Programme: B.Sc.	**Semester** – V
	Type: DSE	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT354 E-II: Military Life Sciences: Survival and Medical Aid	

Course Objectives: Students should be able to:

1. Understand the essential anatomical, physiological, and nutritional principles relevant to military field survival and first response care.
2. Learn standard medical protocols such as CPR, wound care, burn treatment, and insect/snakebite management.
3. Study emergency situations to determine appropriate survival strategies, including diet, sanitation, and disease prevention.
4. Understand creating emergency hygiene kits, field rations, and basic survival plans using minimal available resources.

Course Outcomes: Student will be able to:

1. key anatomical structures and vital signs relevant to battlefield medical aid.
2. Demonstrate effective first aid, CPR, splinting, burn management, and emergency response procedures.
3. Plan and execute basic survival nutrition strategies, including safe foraging and field ration preparation.
4. Implement field hygiene and camp disease prevention protocols for long-term troop deployment.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Human Body Basics for Field Care** Anatomy relevant to field injuries Vital signs and their importance First aid basics Emergency response protocols Demonstrations on CPR and wound management	**(08)**
Module -2:	**Module -2: Field Emergency Medical Procedures** Bandaging, splinting, and basic surgery Burn care in field Dealing with hypothermia and heat stroke Snakebite and insect bite management	**(07)**
Module -3:	**Module-3: Food and Nutrition for Soldiers** High energy diet planning	**(08)**

	Water needs and electrolyte management Ration preparation and preservation Safe foraging basics Emergency meal preparation drills	
Module -4:	**Module -4: Disease Prevention and Hygiene in Camps** Camp sanitation methods Water purification revisited Infectious disease control Personal hygiene protocols Hands-on hygiene kit preparation	**(07)**

Reference Books:

1. Khanna, Dinesh. First Aid and Emergency Care. New Delhi: CBS Publishers & Distributors, 2021.
2. Sood, D.K. Manual of First Aid Practices. New Delhi: Jaypee Brothers Medical Publishers, 2016.
3. Park, K. Park's Textbook of Preventive and Social Medicine. 26th ed. Jabalpur: Banarsidas Bhanot, 2021.
4. Banerjee, B. A Textbook of Human Physiology. New Delhi: S. Chand & Company, 2020.
5. Wilson, G.D., and Arjun Patel. Military Field Medicine and Tactical Combat Care. New Delhi: Pentagon Press, 2019.
6. Satyanarayana, U., and Chakrapani, U. Essentials of Biochemistry. Hyderabad: Elsevier India, 2020.
7. Sharma, A. Nutrition and Dietetics. New Delhi: Kay Cee Publishers, 2018.

Evaluation Pattern:

Total Marks: 50

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Programme: B.Sc.	**Semester** – V
Type: DSC	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCP355: Weapon Control and Automation Systems	

Course Objectives: Students should be able to:

1. Understand the concepts of open/closed-loop systems and the role of feedback in military automation.
2. Learn principles of control systems to simulate real-life defense scenarios using sensors and actuators.
3. Study operational differences between wired and wireless weapon control systems.
4. Understand simple and functional prototypes representing control and automation in modern weapon systems.

Course Outcomes: Student will be able to:

1. Describe the core components and functioning of military automation systems through hands-on models.
2. Build sensor-based servo systems and troubleshoot basic failures in simulated environments.
3. Demonstrate a working knowledge of remote weapon system control circuits.
4. Design and simulate basic field systems representing real military automation using low-cost kits.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Construct a basic open-loop and closed-loop control system model using Arduino 2. Measure feedback using an IR or ultrasonic sensor and display on serial monitor 3. Create a motor-based aiming mechanism with potentiometer feedback 4. Simulate turret control with servomotor and joystick interface 5. Build a basic line-follower robot to demonstrate path correction (sensor-feedback loop) 6. Calibrate a temperature sensor-based automatic fan control circuit 7. Demonstrate control stability using PID control simulation in Proteus/TinkerCAD 8. Develop a wired triggering system with LED and switch setup 9. Create a wireless RF-based triggering module (e.g., remote ignition demo) 10. Interface a servomotor with push-button and PWM for angle control 11. Construct a hydraulic arm demo using syringes to mimic actuator motion	**(60)**

	12. Setup a pneumatic model with balloon & syringe-based demo for airflow actuation 13. Troubleshoot common sensor-input and actuator-output failures (e.g., loose wire, no signal) 14. Demonstrate redundancy using two sensors controlling the same actuator 15. Simulate a UAV rudder control using two servo motors and toggle switches 16. Create a basic RC-controlled robot using Arduino and RF modules 17. Develop an LED warning system activated on specific sensor feedback (e.g., obstacle, pressure) 18. Simulate emergency field repair: diagnose and reconnect cut circuit paths 19. Implement an 8-channel relay control using Arduino for multi-actuator system 20. Build a model of a remote-controlled weapon station (non-working dummy with logic circuitry)	

Reference Books:

1. Ogata, Katsuhiko. Modern Control Engineering. 5th ed. Delhi: Pearson Education India, 2011.
2. Nagrath, I.J., and M. Gopal. Control Systems Engineering. 6th ed. New Delhi: New Age International, 2018.
3. Bolton, W. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. 7th ed. Delhi: Pearson India, 2021.
4. Petruzella, Frank D. Programmable Logic Controllers. 4th ed. New Delhi: McGraw-Hill Education, 2017.
5. Monk, Simon. Programming Arduino: Getting Started with Sketches. 2nd ed. New Delhi: McGraw-Hill Education, 2016.
6. Banerjee, Amitava. Industrial Instrumentation and Control. New Delhi: PHI Learning Pvt. Ltd., 2014.

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):	**Practical Exam Paper (30 Marks):**
• Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Perform two experiments (15 Marks each)

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	Programme: B.Sc.	**Semester** – V
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCP356: Directional Physics in Battlefield Deployment Lab	

Course Objectives: Students should be able to:

1. Understand basic scientific and tactical principles behind field deployment, navigation, camouflage, and low-cost equipment design.
2. Learn practical skills in constructing and using military tools and techniques.
3. Study environmental and battlefield factors affecting navigation, observation, and detection.
4. Understand improvised field solutions using low-cost or indigenous materials relevant to military training and survival.

Course Outcomes: Student will be able to:

1. Demonstrate core battlefield utility skills like direction finding, mapping, fortification, and terrain analysis.
2. Operate and test improvised navigation, detection, and observational tools effectively under field-simulated conditions.
3. Evaluate the accuracy and reliability of basic military instruments and field techniques in low-resource conditions.
4. Design and construct simple models for battlefield application using inexpensive and recyclable materials.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Making a Simple Magnetic Compass Construct a working compass using magnetized needle 2. Using Prismatic Compass for Direction Finding Measure bearings and azimuth 3. Range Finding using Plane Mirror Method Estimate distance using reflection 4. Constructing a Simple Periscope Build a lowcost periscope for observation 5. Triangulation for Object Location Locate an object using angular measurements 6. Thermal Detection Using IR Sensor Use lowcost IR sensors for heat detection	**(60)**

	7. Camouflage and Concealment Techniques Apply camouflage using local materials 8. Mock Slit Trench Construction Demonstrate trench design in a small plot or model 9. Field Sketch and Mapping Exercise Practice drawing a field map to scale 10. Basic Angle Measurement in Field Use compass and protractor to measure angles 11. Night Navigation with Glow Stick Compass Navigate using glow marked compass 12. Detection of Magnetic Interference Zones Map areas of magnetic distortion 13. Thermal Imaging Demonstration Observe warm objects with a low-cost IR camera 14. Preparing Sandbag Wall Models Build a small, fortified wall with cloth bags 15. Field Fortification Layout Planning Design layout for a defense base 16. Tactical Signalling with Hand Flags Practice military flag signals 17. Observation Post Construction (Miniature) Design small OP model with cardboard 18. Weather Direction Observation Record wind direction and speed with basic tools 19. Water Source Detection using Soil Absorption Test Assess water content underground 20. Mock Mine Detection Drill (Safe) Practice layout and search using safe indicators	

Reference Books:

1. Puri, R. K. Basics of Infrared Technology and Applications. New Delhi: Dhanpat Rai Publishing, 2015.
2. Duggal, Vijay Kumar. Elements of Geomatics. Hyderabad: Universities Press, 2013.
3. Sharma, R. K., and Shashi Bala. Modern Military Survey and Fieldcraft. New Delhi: Natraj Publishers, 2016.
4. Rajput, R. K. Applied Physics for Engineers. New Delhi: S. Chand Publishing, 2012.
5. Ministry of Defence, Government of India. Military Engineering Field Manuals – Vol I & II. Delhi: DGMT Publications, 2020.
6. Nair, C. P. Military Map Reading and Field Sketching. New Delhi: Pointer Publishers, 2017.
7. Tripathi, S. K. Fundamentals of Military Science. New Delhi: Neha Publishers, 2020.

Evaluation Pattern:

Total Marks: 50	
Journal, Students' Performance Viva, Project (20 Marks): • Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	**Practical Exam Paper (30 Marks):** • Section I: Perform two experiments (15 Marks each)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – V
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCP357: Military Science Elective Practical Lab – I	

Course Objectives: Students should be able to:

1. Understand the principles of magnetic and optical navigation for military field movement.
2. Apply geometric and visual estimation techniques to locate targets and calculate tactical positioning.
3. Study data patterns and risk models to inform tactical decisions during simulated combat exercises.
4. Understand simplified combat operation models using algebra, graphing, or statistical representation for planning exercises.

Course Outcomes: Student will be able to:

1. Demonstrate practical navigation using magnetic tools and correct for declination and field interference.
2. Construct basic field-viewing and range-finding devices using low-cost optical materials
3. Apply optimization techniques such as shortest path and resource allocation to battlefield logistics.
4. Interpret tactical field data and prepare decision-support documents using charts, graphs, and tables.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Construct and calibrate a simple magnetic compass using a magnetized needle and cork. 2. Field navigation using magnetic compass and mapping with declination correction. 3. Demonstrate effect of magnetic interference (metallic objects, electronics) on compass accuracy. 4. Build a basic cardboard periscope to demonstrate line-of-sight and reflection. 5. Calculate field of view and range estimation using hand-made optical instruments. 6. Perform triangulation to locate a hidden object using simple angle and distance methods. 7. Measure angles and distances on field maps using geometry and scale calculations. 8. Plot a field area and mark sighting points using compass and scale (topographical sketching).	**(30)**

	9. Assemble a basic thermal IR sensor circuit using low-cost IR sensors (e.g., KY-026 or MLX90614). 10. Simulate a night surveillance setup with a heat source and detect it using thermal/IR sensor.	
Section -2:	**List of Practicals:** 1. Develop a simple combat force model using algebraic assumptions (e.g., Lanchester's linear law). 2. Simulate resource consumption vs time in a mock operation using graph plotting. 3. Use MS Excel to calculate basic probabilities and expected values in a battlefield scenario. 4. Create a risk assessment matrix for a patrolling mission (likelihood × impact). 5. Apply shortest path algorithms on a military base map to simulate quick troop movement. 6. Solve a two-variable linear programming problem using the graphical method (e.g., ammo vs fuel). 7. Collect mock field survey data (e.g., terrain observation) and calculate mean, median, and mode. 8. Plot frequency distributions and histograms to understand trend analysis for enemy movement. 9. Prepare and interpret a pie chart or bar graph showing resource allocation across combat units. 10. Draft a tactical decision report using analysed data, including visual representations and interpretation.	**(30)**

Reference Books:

1. Kapoor, A. K. Textbook of Field Craft and Navigation. New Delhi: Neelkamal Publications, 2020.
2. Prasad, R.D. Military Field Engineering and Topography. New Delhi: Natraj Publishers, 2016.
3. Singh, R.K. Weapon Training and Tactical Movements. New Delhi: Pointer Publishers, 2018.
4. Dey, A.K. Military Tactics and Combat Techniques. New Delhi: Discovery Publishing House, 2021.
5. Taha, Hamdy A. Operations Research: An Introduction. 10th ed. New Delhi: Pearson Education India, 2017.
6. Sharma, J.K. Operations Research: Theory and Applications. 5th ed. New Delhi: Macmillan India, 2013.
7. Ross, Sheldon M. Introduction to Probability Models. 11th ed. New Delhi: Academic Press/Elsevier India, 2017.
8. Kapoor, V.K. Operations Research. New Delhi: Sultan Chand & Sons, 2022.

Evaluation Pattern:	
Total Marks: 50	
Journal, Students' Performance Viva, Project	**Practical Exam Paper (30 Marks):**

(20 Marks): • Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Attempt questions (one questions of 15 Marks) • Section II: Attempt questions (one questions of 15 Marks)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – V
	Type: VSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCPVSC III Military Field Communication Systems and Protocols	

Course Objectives: Students should be able to:

1. Understand the fundamental principles of radio communication and signal propagation in field operations. (Cognitive: Understand)
2. Study practical skills in setting up and maintaining communication devices such as radios, antennas, and satellite tools. (Cognitive: Apply)
3. Learn different communication configurations (VHF/UHF/Satellite) and their effectiveness in various terrains. (Cognitive: Analyze)
4. Understand emergency and disaster communication networks and simulate field protocols

Course Outcomes: Student will be able to:

1. Demonstrate the ability to assemble, align, and test basic military and emergency communication systems.
2. Construct and fine-tune various antennas and signal reception tools including SDRs and satellite simulators.
3. Operate field radios and communication software and conduct maintenance and signal testing procedures.
4. Simulate and troubleshoot point-to-point and satellite communication in mock operational scenarios.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Assembling a simple AM/FM radio receiver 2. Building a basic crystal radio 3. Testing a handheld walkie-talkie (range test) 4. Frequency scanning and monitoring using SDR 5. Basic antenna construction and tuning 6. Establishing a point-to-point VHF/UHF link 7. Installation and alignment of simple Yagi antenna 8. Weather satellite image reception (APT signals) 9. Software-based communication simulation 10. Field setup of basic communication node 11. Signal jamming experiment (in lab conditions)	**(60)**

	12. Signal strength measurement using RF Meter 13. Setting up a basic satellite communication simulator 14. Emergency communication setup 15. Testing different antenna types (whip, dipole) 16. Maintenance drill of handheld radio 17. Frequency management simulation using open-source tools 18. Voice communication protocol drills 19. Satellite tracking using open-source apps 20. Field communication during mock disaster drill	

Reference Books:

1. Sharma, A. P. Wireless and Mobile Communication. New Delhi: Khanna Publishing House, 2019.
2. Mitra, R. N. Principles of Communication Systems. 3rd ed. New Delhi: Tata McGraw-Hill, 2020.
3. Kennedy, George, and Bernard Davis. Electronic Communication Systems. 4th ed. New Delhi: Tata McGraw-Hill, 2018.
4. Rao, R. M. Antennas and Wave Propagation. 2nd ed. New Delhi: Pearson Education India, 2021.
5. Bayindir, Ramazan. Software Defined Radio using MATLAB and Simulink and the RTL-SDR. New Delhi: CRC Press India, 2020.
6. Haykin, Simon. Communication Systems. 5th ed. New Delhi: Wiley India, 2022.
7. ARRL. ARRL Ham Radio License Manual. 4th ed. Newington: American Radio Relay League, 2019. (Available via Indian amateur radio retailers)

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):	**Practical Exam Paper (30 Marks):**
• Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Perform two experiments (15 Marks each)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – V
	Type: VSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCPVSC IV Intelligence Gathering and Reconnaissance Techniques	

Course Objectives: Students should be able to:

1. Understand the fundamental concepts and importance of field observation, terrain assessment, and basic surveillance skills in military settings.
2. Learn basic techniques of footprint tracking, terrain scanning, and use of improvised tools for gathering tactical information
3. Study simulated intelligence scenarios using mock interviews, memory recall, and visual scanning under varying environmental conditions.
4. Understand creation of effective observation reports and tactical vulnerability assessments through strategic field exercises.

Course Outcomes: Student will be able to:

1. Demonstrate skills in field observation, terrain analysis, and movement recording through structured and unstructured environments.
2. Employ concealment, memory sketching, and low-light tactics effectively in reconnaissance and surveillance operations.
3. Interpret signs, movements, and simulated enemy activity for early threat detection and basic intelligence formation.
4. Design and execute basic field-based simulations such as observation posts, message decryption, and dead drop techniques.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Observing and recording movement in an area 2. Drawing field sketches of surroundings 3. Practicing terrain analysis using binoculars 4. Identifying and tracking footprints 5. Simulated listening post and report creation 6. Making and using observation logs 7. Disguise and concealment techniques 8. Interview-based mock intelligence gathering 9. Building a small periscope for observation 10. Measuring distances using improvised methods	**(60)**

	11. Observation through cover: cracks, foliage, etc. 12. Creating a memory sketch after 5-minute scan 13. Practicing observation under low-light conditions 14. Gathering intel through mock civilian interaction 15. Recognizing signs of enemy presence (simulated) 16. Conducting mock security breach assessments 17. Simulated message decryption exercises 18. Creating a simple dead drop or message pass 19. Night-time silent observation drills 20. Assessing vulnerability of local structures	

Reference Books:

1. Singh, Jasjit. Military Strategy for India in the 21st Century. New Delhi: KW Publishers, 2013.
2. US Army. FM 3-21.8: The Infantry Rifle Platoon and Squad. New Delhi: Pentagon Press, 2010.
3. Hughes, Wayne P. Fleet Tactics and Coastal Combat. 2nd ed. New Delhi: Naval Institute Press / Pentagon Library Edition, 2014.
4. Yadav, Vivek. Fundamentals of Military Geography and Fieldcraft. New Delhi: Wisdom Press, 2021.
5. Horowitz, Michael C. The Diffusion of Military Power: Causes and Consequences for International Politics. New Delhi: Oxford University Press, 2010.
6. Chakrabarti, Ranjan. Fieldwork in Military Geography. Kolkata: Worldview Publications, 2016.
7. Indian Army. Handbook on Fieldcraft and Battlecraft. New Delhi: Army Training Command (ARTRAC), Ministry of Defence.

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks): • Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	**Practical Exam Paper (30 Marks):** • Section I: Perform two experiments (15 Marks each)

	**Karmaveer Bhaurao Patil University, Satara** (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Military Science
Programme: B.Sc.	**Semester** – V
Type: FP	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCFP 1: Field Project in Military Science	

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Military Science
Programme: B.Sc.	**Semester** – V
Type: CEP	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCFP 1: BNCCTCEP 1: Community Engagement Programme in Military Science	

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT361: Advanced Target Detection Systems	

Course Objectives: Students should be able to:

1. Understand the principles and applications of modern field surveillance technologies including radar, sonar, and infrared tools.
2. Learn various types of sensors and tracking systems used in computational warfare and battlefield scenarios.
3. Study knowledge of motion detection, drone systems, and IR circuits to simulate practical military surveillance setups.
4. Understand the efficiency of field surveillance systems for tactical decision-making in simulated environments.

Course Outcomes: Student will be able to:

1. Identify and describe the working principles of radar, sonar, night vision, and IR-based surveillance systems.
2. Demonstrate and simulate simple surveillance and detection systems like motion detectors and IR perimeter alarms.
3. Analyze the practical applications and limitations of computational tools used in tactical warfare scenarios.
4. Evaluate the effectiveness of drone-based tracking and detection systems through mock drills and experiments.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Introduction to Field Surveillance Tools** Types of surveillance equipment Night vision basics Motion detection sensors Building simple motion alarm systems Field demos procedure	**(08)**
Module -2:	**Module -2: Basics of Radar and Sonar Principles** Radar equation basics Simple reflection and detection experiments Sonar principles in water detection Simulating simple sonar devices Field experiments on reflection	**(07)**

Module -3:	**Module-3: Infrared and Heat Signature Detection** Concepts of thermal imaging BASIC IR sensor circuits Simulating basic IR perimeter defense Human detection techniques using IR Field demonstrations	**(08)**
Module -4:	**Module -4: Drone-based Target Tracking Basics** Working of tactical drones Basics of drone imaging systems Building and controlling small BASIC drones Drone surveillance drills Target identification using drones	**(07)**

Reference Books:

1. Skolnik, Merrill I. Introduction to Radar Systems. 3rd ed. New Delhi: Tata McGraw-Hill Education, 2001.
2. Richharia, M., and Leslie David. Satellite Communication Systems: Design Principles. 2nd ed. Oxford: Oxford University Press India, 2011.
3. Mohan, D. R., and K. P. R. Nair. Sensors and Transducers. New Delhi: PHI Learning Pvt. Ltd., 2011.
4. Singh, R. S. Electronic Warfare: Principles and Applications. New Delhi: Khanna Publishers, 2014.
5. Singh, J. Fundamentals of Drone Technology. New Delhi: BPB Publications, 2020.
6. Shukla, A. K. Principles of Infrared Technology and Thermal Imaging. Mumbai: Technical Publications, 2021.
7. Sharma, S. C. Radar and Sonar Systems. New Delhi: S. K. Kataria & Sons, 2019.
8. Raghavan, V. Introduction to Military Surveillance and Reconnaissance Tools. Chennai: DefTech India Publishers, 2022.

Evaluation Pattern:

Total Marks: 50

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

	evaluation to 30 Marks

Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Military Science

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

Name of the Course: BNCCT362: Warfare Communication Systems

Course Objectives: Students should be able to:

1. Understand the foundational concepts of military communication systems including types, components, and tactical applications.
2. Learn to operate and demonstrate basic communication tools such as short-range radios, Morse code, and RF systems.
3. Study the effects of jamming and encryption on communication flow in tactical scenarios.
4. Understand a basic tactical communication network using wired, wireless, and encrypted protocols with available field equipment.

Course Outcomes: Student will be able to:

1. Explain the types of military communication systems and their operational principles.
2. Demonstrate the practical setup and usage of short-range field communication tools.
3. Evaluate different jamming and counter-jamming methods in RF-based communication.
4. Design and simulate a basic encrypted field communication system for tactical use.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Basics of Military Communication Networks** Types: Wired, wireless, satellite Radio wave basics and field communication Setup of short-range field radios Encryption basics Detail simple field radio setup procedure	**(08)**

Module -2:	**Module -2: Signal Encoding and Decoding Techniques** Morse code and field encryption Signal flags, hand signs Basics of cryptography Field exercises with manual encoding Message security drills	**(07)**
Module -3:	**Module-3: Wireless Communication and Jamming** Basic RF communication theory Field impact of jamming Signal detection methods Hands-on RF scanner demonstration	**(08)**
	Anti-jamming tactics	
Module -4:	**Module -4: Setting up Tactical Communication Systems** Building simple mesh networks Portable radio station setup Practical exercises in setting up field communication Quick field repair of communication devices Communication exercise simulations	**(07)**

Reference Books:

1. Singh, R.K. Fundamentals of Military Communication Systems. New Delhi: Surya Publications, 2018.
2. Sharma, V.P. Modern Tactical Communications and Encryption. Delhi: Pentagon Press, 2021.
3. Chatterjee, B. Radio Wave Propagation and Field Applications. Hyderabad: Universities Press, 2019.
4. Goyal, M. Applied Wireless Communication for Field Operations. New Delhi: PHI Learning Pvt. Ltd., 2020.
5. Rao, A.S. Introduction to Cryptography and Secure Communication. Bangalore: McGraw-Hill Education, 2021.
6. Military College of Telecommunication Engineering (MCTE). Signal Training Manual Part I. Mhow: Indian Army Press, Revised Ed. 2017.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Military Science
Programme: B.Sc.	**Semester** – VI
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCT363: E-I Field Craft and Battle Craft (FCBC)	

Course Objectives: Students should be able to:

1. Understand the principles of fieldcraft including camouflage, concealment, and movement in tactical scenarios.
2. Learn correct crawling, movement, and signaling techniques in field exercises.
3. Study different section formations, patrolling, and ambush procedures in battle-like situations.
4. Understand terrain and cover options for practical night navigation, mock patrols, and map reading without GPS

Course Outcomes: Student will be able to:

1. Demonstrate practical knowledge of field signals, movement techniques, and crawling methods.
2. Analyze tactical maps and terrain layouts for use in field-based operations without modern digital tools.
3. Plan and participate in mock missions and patrols using acquired battle craft skills like fire and movement, and ambush tactics.
4. Evaluate personal and team performance in field exercises and simulated combat drills.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Introduction to Field Craft** Camouflage and concealment Observation and target indication Judging distance Field signals	**(08)**
Module -2:	**Module -2: Movement Techniques** Crawling techniques Crossing obstacles Use of cover and concealment Night movement basics	**(07)**
Module -3:	**Module-3: Battle Craft Basics** Section formation and movement Fire and movement tactics Introduction to ambush and patrolling Section battle drills Anti-jamming tactics	**(08)**
Module -4:	**Module -4: Field Application Exercises**	**(07)**

	Practical map reading without GPS Night navigation Mock patrol missions Simulated battle drills	

Reference Books:

1. Singh, Jasbir. Military Tactics and Fieldcraft. New Delhi: Wisdom Press, 2018.
2. Raina, P.S. Fundamentals of Military Strategy and Tactics. New Delhi: Vij Books India Pvt. Ltd., 2020.
3. NCC Directorate. Cadet's Handbook on Fieldcraft and Battlecraft. New Delhi: Directorate General NCC, Ministry of Defence, 2022.
4. Banerjee, B.N. Introduction to Infantry Tactics. Kolkata: Eastern Book Agency, 2017.
5. Sharma, R. K. NCC Field Craft and Tactics Manual. Jaipur: Yuvraj Publishers, 2021.
6. Dubal R. S., Capt. Gaikwad M.N., (August 2020), Handbook of NCC Tanvi prakashan.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSE	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT363: E-II Battlefield Energy Systems	

Course Objectives: Students should be able to:

1. Understand the basic principles and types of portable and renewable energy sources applicable in field and battlefield situations.
2. Learn theoretical knowledge to operate, assemble, and maintain simple energy devices such as solar chargers, hand-cranked generators, and field batteries.
3. Study the power requirements and limitations in remote military operations and develop strategies for efficient energy use.
4. Understand basic energy backup plans, renewable power setups, and maintenance schedules for field-deployable systems.

Course Outcomes: Student will be able to:

1. Identify and explain various battlefield energy solutions and technologies such as solar chargers, hand-cranked systems, and field batteries.
2. Demonstrate hands-on proficiency in assembling, testing, and troubleshooting portable energy systems under simulated field conditions.
3. Analyze energy consumption patterns in remote deployments and propose energy-efficient plans.
4. Design and simulate an independent, field-based renewable energy solution suited for emergency military use.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Portable Energy Sources for Soldiers** Solar energy basics Hand-cranked generators Field batteries and their management BASIC solar charger project Testing field energy systems	**(08)**
Module -2:	**Module -2: Energy Storage and Conservation in Field** Basics of battery technologies Field maintenance of power banks Designing energy-efficient systems Energy conservation strategies Practical power budgeting	**(07)**
Module -3:	**Module-3: Renewable Energy in Remote Military Operations**	**(08)**

	Small scale solar, wind, hydro solutions Creating basic wind turbines Energy calculations for survival camps Practical demos of micro-hydro models Off-grid energy system simulations	
Module -4:	**Module -4: Power Failure Handling and Backup Systems** Redundancy planning Setting up backup communication and lighting Emergency solar kits Practical exercises in blackout recovery Field-tested backup plans	**(07)**

Reference Books:

1. Sharma, S. P. Non-Conventional Energy Resources. New Delhi: Kataria & Sons, 2018.
2. Rai, G. D. Non-Conventional Energy Sources. New Delhi: Khanna Publishers, 2017.
3. Bansal, N. K., M. Kleemann, and M. Helms. Renewable Energy Sources and Conversion Technology. New Delhi: Tata McGraw Hill, 2012.
4. Rajput, R. K. Energy Management. New Delhi: Laxmi Publications, 2013.
5. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. 11th ed. New Delhi: Pearson Education, 2015.
6. Patel, B. H. Renewable Energy Sources and Their Environmental Impact. New Delhi: PHI Learning, 2020.
7. Ministry of New and Renewable Energy. MNRE Manuals and Handbooks on Solar and Small Hydro Applications. Government of India, latest editions available online or in print from MNRE or NISE.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Military Science
Programme: B.Sc.	**Semester** – VI
Type: DSE	**Marks:** 50
Credits: 2	**From:** A. Y. 2025-26
Name of the Course: BNCCT364: E-I Tactical Computer Networks and Cyber Security	

Course Objectives: Students should be able to:

1. Understand the basic structure of tactical networks and cyber threats in military operations.
2. Learn networking and encryption techniques in field-based communication setups.
3. Study common cyber-attacks and identify response strategies for military scenarios.
4. Understand basic security protocols and field response plans against simulated cyber threats.

Course Outcomes: Student will be able to:

1. Describe the architecture and functioning of LAN/WAN and tactical field networks used in defense operations.
2. Demonstrate the ability to configure secure ad-hoc wireless networks and apply cyber hygiene measures.
3. Analyze potential cyber attack vectors and propose immediate counter-response plans in military contexts.
4. Design and implement a basic encrypted message communication system using public-private key methods in simulated field conditions.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Basic Concepts of Networking** LAN, WAN, Internet basics Setting up simple networks Cabling and wireless setup demonstrations IP addressing basics Field setting up ad-hoc networks	**(08)**
Module -2:	**Module -2: Threats and Attacks in Cyber Space** Viruses, phishing, malware Defense strategies Basic cyber hygiene for soldiers Simulated phishing attack exercises Field response drills	**(07)**
Module -3:	**Module-3: Encryption for Secure Military Communication** Basics of public-private keys Setting up basic encrypted communication	**(08)**

	Basic message encryption procedure Field simulations	
Module -4:	**Module -4: Cyber Warfare and Defense Scenarios** Cyber attack case studies Simple cyber defense games Simulating cyber breach and defense Preparing incident response strategies Case study procedure: Red Team vs Blue Team field exercises	**(07)**

Reference Books:

1. Andress, Jason. Foundations of Information Security. 2nd ed. New Delhi: Cengage India, 2020.
2. Stallings, William. Cryptography and Network Security: Principles and Practice. 7th ed. Noida: Pearson Education India, 2017.
3. Ramakrishnan, R. and Geetha, R. Computer Networks: Protocols, Standards and Interfaces. Chennai: SCITECH Publications, 2018.
4. Gupta, Sushil. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices. New Delhi: PHI Learning Pvt. Ltd., 2015.
5. Sharma, Manish. Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners. New Delhi: Wiley India, 2021.
6. National Defence University. Cyber Operations and Military Strategy. New Delhi: Pentagon Press, 2022.
7. Department of Electronics and IT (DeitY), Government of India. Cyber Security Handbook for Defence Forces. New Delhi: Ministry of Defence, 2021.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSE	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCT364: E-II Leadership and Discipline	

Course Objectives: Students should be able to:

1. Understand the core leadership qualities essential for performance in military and field environments.
2. Learn the importance of discipline and the application of military codes of conduct in team and mission settings.
3. Study leadership models and tactical planning methods through simulations, case studies, and role-playing.
4. Understand team dynamics and evaluate leadership effectiveness through behavioral and decision-making exercises.

Course Outcomes: Student will be able to:

1. Recall and describe key leadership models, qualities, and field discipline principles used in military operations.
2. Interpret behavioral responses and leadership decisions in case-based battlefield and team-building scenarios.
3. Demonstrate effective field discipline and leadership through practical drills, simulation, and team games.
4. Evaluate leadership performance and tactical decisions using structured rubrics during role-play and analysis tasks.

Module	Title and Contents	Hrs.
Module -1:	**Module -1: Leadership Qualities for Battlefield Success** Characteristics of effective leaders Leadership models and field decision-making Role playing leadership exercises Case studies: Leadership evaluation games	**(08)**
Module -2:	**Module -2: Importance of Discipline and Code of Conduct** Meaning of military discipline Field application of codes Practical discipline drills Behavioral analysis games	**(07)**
Module -3:	**Module-3: Tactical Planning and Team Building** Elements of mission planning	**(08)**

	Formation of teams Field team-building games Simulation exercises in small units	
Module -4:	**Module -4: National Service and Social Responsibility** Importance of civil-military cooperation Participation in national service programs Conducting mock community service Simulating disaster relief responses	**(07)**

Reference Books:

1. Singh, G.D. Leadership and Discipline in the Armed Forces. New Delhi: Pentagon Press, 2018.
2. Maxwell, John C. The 21 Irrefutable Laws of Leadership. New Delhi: HarperCollins Leadership India, 2020.
3. Sharma, R.C. Military Psychology and Leadership. New Delhi: Wisdom Press, 2016.
4. Mukherjee, K.K. Military Leadership: The Art of Command. New Delhi: Knowledge World Publishers, 2014.
5. Tewari, R.K. Military Discipline and Ethics. Lucknow: Pragati Prakashan, 2017.
6. Indian Army. The Fundamentals of Leadership and Military Discipline. Army Training Command (ARTRAC), Government of India, 2015.
7. Taneja, S.K. Disaster Management and National Service. New Delhi: Abhishek Publications, 2021.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCP365: Advanced Target Detection Systems Lab	

Course Objectives: Students should be able to:

1. Understand the working principles and basic design of computational surveillance and detection tools used in military scenarios.
2. Learn hands-on skills to simulate and test motion detectors, IR circuits, radar/sonar principles, and simple drone systems.
3. Study cost-effective improvisation and application of theoretical principles through BASIC surveillance tools.
4. Understand analytical thinking in evaluating surveillance tool effectiveness and limitations in simulated conditions.

Course Outcomes: Student will be able to:

1. Identify and classify various computational tools used in tactical surveillance.
2. Apply fundamental circuit and sensor-based knowledge to build and test field surveillance systems.
3. Analyze the performance of simulated radar, sonar, IR, and motion systems in mock battlefield environments.
4. Evaluate and interpret data from experimental setups to enhance tactical awareness and tool deployment.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Assembly of PIR Motion Detector 2. Designing a Simple IR Tripwire Alarm 3. Building a Mini Night Vision Goggle (IR-based) 4. Setting up Motion-Activated Light System 5. Radar Reflection Simulation using Ultrasonic Sensors 6. Creating a Mini Sonar System 7. Thermal Heat Mapping Using IR Thermometers 8. Construction of IR Perimeter Fence (Model) 9. BASIC Sound Sensor Trigger for Field Alarms 10. Direction Finding Using Two IR Detectors 11. Human Motion Pattern Study Using IR & PIR 12. Obstacle Detection for Drones (Simulation) 13. Wireless Camera Surveillance with Low-Cost Webcams	**(60)**

	14. Simulating Field Communication Jamming 15. Programming Drone to Follow a Target 16. Heat Signature Comparison: Man vs Object 17. Reflection Angle Demo Using Mirrors (Radar Simulation) 18. Simulating Noise Detection for Sonar 19. Detection Range Study: IR vs PIR 20. Mock Drill: Intruder Alert System	

Reference Books:

1. Skolnik, Merrill I. Introduction to Radar Systems. 3rd ed. New Delhi: Tata McGraw-Hill Education, 2001.
2. Mohan, D. R., and K. P. R. Nair. Sensors and Transducers. New Delhi: PHI Learning Pvt. Ltd., 2011.
3. Sharma, S. C. Radar and Sonar Systems. New Delhi: S. K. Kataria & Sons, 2019.
4. Singh, J. Fundamentals of Drone Technology. New Delhi: BPB Publications, 2020.
5. Shukla, A. K. Principles of Infrared Technology and Thermal Imaging. Mumbai: Technical Publications, 2021.
6. Gupta, R. S. Electronic Devices and Circuits. New Delhi: S. Chand Publishing, 2018.
7. Raghavan, V. Introduction to Military Surveillance and Reconnaissance Tools. Chennai: DefTech India Publishers, 2022.

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):	**Practical Exam Paper (30 Marks):**
• Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Perform two experiments (15 Marks each)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCP366: Warfare Communication Systems Lab	

Course Objectives: Students should be able to:

1. Understand the basic structure and principles of military communication systems.
2. Learn the use and handling of short-range radio and signal equipment.
3. Study hands-on skills in encryption, jamming, and field communication techniques.
4. Understand practical simulation and setup of tactical communication in low-resource environments.

Course Outcomes: Student will be able to:

1. Understand the types, components, and behavior of military communication networks
2. Demonstrate manual and electronic communication tools such as Morse code and RF radios.
3. Analyze real-time field communication vulnerabilities and jamming scenarios.
4. Construct a basic operational communication system using simple devices.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Morse Code Encoding and Decoding 2. Semaphore Flag Signalling 3. Hand Signal Drill 4. Message Passing Relay 5. Simple Wired Telephone Setup 6. Signal Message Logging Format 7. Manual Field Encryption 8. Use of Flashlight for Silent Messaging 9. Assembly of Toy Walkie-Talkie Circuits 10. Field Simulation: Two-Station Communication 11. Build a Whistle-Based Signalling Pattern 12. RF Jammer Simulation (Theoretical + Safe Demo) 13. Demonstration: Anti-jamming Pattern Switching 14. Observation of Military Communication Antennas (Visuals) 15. Building Basic Mesh Network Layout (Paper-based) 16. Practicing Quick Field Setup of Communication Kits 17. Antenna Direction and Orientation Impact Test 18. Short-range Laser Light Signalling 19. Mock Signal Repair	**(60)**

	20. Communication Drill Simulation	

Reference Books:

1. Singh, R. K. Fundamentals of Military Communication Systems. New Delhi: Surya Publications, 2018.
2. Sharma, V. P. Modern Tactical Communications and Encryption. Delhi: Pentagon Press, 2021.
3. Rao, A. S. Introduction to Cryptography and Secure Communication. Bangalore: McGraw-Hill Education, 2021.
4. Chatterjee, B. Radio Wave Propagation and Field Applications. Hyderabad: Universities Press, 2019.
5. Military College of Telecommunication Engineering (MCTE). Signal Training Manual Part I. Mhow: Indian Army Press, Revised Ed. 2017.
6. Goyal, M. Applied Wireless Communication for Field Operations. New Delhi: PHI Learning Pvt. Ltd., 2020.
7. Bhatt, S. K. Wireless and Mobile Communications. Pune: Technical Publications, 2018.

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):	**Practical Exam Paper (30 Marks):**
• Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Perform two experiments (15 Marks each)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: DSE	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCP367: Military Science Elective Practical Lab – II	

Course Objectives: Students should be able to:

1. Understand the fundamental principles of fieldcraft and their role in tactical operations.
2. Learn basic field techniques such as camouflage, movement, and obstacle crossing.
3. Study various cyber threats and simulate response strategies for defense environments.
4. Understand basic cryptographic systems and implement secure military communication.

Course Outcomes: Student will be able to:

1. Identify and apply basic fieldcraft techniques including concealment, cover, crawling, and signals.
2. Evaluate terrain, distance, and observation parameters using map reading and judgment techniques.
3. Simulate phishing attacks, malware defense drills, and field response techniques.
4. Encrypt and decrypt basic messages using public-private key encryption in field setups.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. 1. Camouflage Using Natural Materials 2. Crawling Techniques Practice 3. Judging Distance by Eye Estimation 4. Observation Practice with Sketching 5. Field Signal Communication 6. Crossing Simple Obstacles 7. Map Reading Without GPS 8. Night Navigation Using Stars/Compass 9. Fire & Movement Tactics (Mock Setup) 10. Conducting a Mock Patrol Mission	**(30)**
Section -2:	**List of Practicals:** 1. Setting up a LAN using Ethernet cables 2. Configuring static IP addresses on devices 3. Creating an ad-hoc wireless network in the field 4. Simulating a phishing email and identifying red flags 5. Scanning a system with antivirus and identifying malware 6. Demonstrating firewall configuration and rule setting 7. Creating and using public-private key pairs for encryption	**(30)**

	8. Encrypting and decrypting a basic text message 9. Red Team vs Blue Team exercise (case simulation) 10. Preparing an Incident Response Plan for a simulated breach	

Reference Books:

1. Indian Army. Infantry Training: Fieldcraft and Battlecraft (All Arms). New Delhi: The Controller of Publications, Ministry of Defence, Government of India, 2021.
2. NCC Directorate. Cadet's Handbook on Fieldcraft and Battlecraft. New Delhi: Directorate General NCC, Ministry of Defence, 2022.
3. Singh, Jasbir. Military Tactics and Fieldcraft. New Delhi: Wisdom Press, 2018.
4. Sharma, R. K. NCC Field Craft and Tactics Manual. Jaipur: Yuvraj Publishers, 2021.
5. Andress, Jason. Foundations of Information Security. 2nd ed. New Delhi: Cengage Learning India, 2020.
6. Stallings, William. Cryptography and Network Security: Principles and Practice. 7th ed. Noida: Pearson Education India, 2017.
7. Tanenbaum, Andrew S., and David J. Wetherall. Computer Networks. 5th ed. Noida: Pearson India, 2020.
8. Gupta, Sushil J. Cybersecurity: A Practical Guide. New Delhi: PHI Learning Pvt. Ltd., 2021.

Evaluation Pattern:

Total Marks: 50

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

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: VSC	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCPVSC V Radio and Signal Equipment Handling Technician	

Course Objectives: Students should be able to:

1. Provide foundational knowledge of radio and satellite communication systems.
2. Develop hands-on skills in setting up, operating, and maintaining basic radio and signal equipment.
3. Understand signal transmission, antenna tuning, frequency management, and basic troubleshooting.
4. Encourage real-world applications by using low-cost, accessible equipment and simulation software.

Course Outcomes: Student will be able to:

1. Identify components of basic radio and satellite systems.
2. Explain signal propagation and communication protocols.
3. Set up and operate basic radio communication and satellite systems.
4. Diagnose and troubleshoot common equipment faults.

Module	Title and Contents	Hrs.
Section -1:	**List of Practicals:** 1. Assembling a simple AM/FM radio receiver 2. Building a basic crystal radio 3. Testing a handheld walkie-talkie (range test) 4. Frequency scanning and monitoring using SDR 5. Basic antenna construction and tuning 6. Establishing a point-to-point VHF/UHF link 7. Installation and alignment of simple Yagi antenna 8. Weather satellite image reception (APT signals) 9. Software-based communication simulation 10. Field setup of basic communication node 11. Signal jamming experiment (in lab conditions) 12. Signal strength measurement using RF Meter 13. Setting up a basic satellite communication simulator 14. Emergency communication setup 15. Testing different antenna types (whip, dipole) 16. Maintenance drill of handheld radio 17. Frequency management simulation using open-source tools	**(60)**

	18. Voice communication protocol drills 19. Satellite tracking using open-source apps 20. Field communication during mock disaster drill	

Reference Books:

1. Taub, Herbert, and Donald L. Schilling. Principles of Communication Systems. New York: McGraw Hill Education.
2. Ludwig, Reinhold. Introduction to RF and Microwave Communications. Boston: Pearson.
3. Roddy, Dennis. Satellite Communications. New York: McGraw Hill Education.
4. Carr, John J. Handbook of Radio Communications. New York: McGraw Hill Professional.
5. ARRL. Amateur Radio Handbook. India: ARRL India / local vendors.

Evaluation Pattern:

Total Marks: 50

Journal, Students' Performance Viva, Project (20 Marks):	**Practical Exam Paper (30 Marks):**
• Journa1: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	• Section I: Perform two experiments (15 Marks each)

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Military Science	
	Programme: B.Sc.	**Semester** – VI
	Type: FP	**Marks:** 50
	Credits: 2	**From:** A. Y. 2025-26
	Name of the Course: BNCCFP II: Field Project in Military Science	

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) **Faculty of Science and Technology**
	Yashavantrao Chavan Institute of Science, Satara
	Board of Studies in Military Science
Programme: B.Sc.	**Semester** – VI
Type: OJT	**Marks:** 50
Credits: 4	**From:** A. Y. 2025-26
Name of the Course: BPPOJT: On Job Training in Military Science	

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