

Academic Year	2021/22	Semester	1
Course Coordinator	Associate Prof. Ranjan Singh		
Course Code	PS8001		
Course Title	Defence Science		
Pre-requisites	None		
Mutually Exclusive	-		
No of AUs	3		
Contact Hours	NA		
Proposal Date	14 December 2020		

Course Aims

This course aims to support you in understanding the role of mathematics, physics, chemistry, environment, and biology in Defence Science.

Intended Learning Outcomes (ILO)

Upon the successful completion of this course, you (as a student) would be **able to**:

1. discuss the significance of mathematics and physical sciences in military and defence applications.
2. describe and explain approaches in disease prevention and public health system, health security and counter measures for bioterrorism.
3. conceive innovative science-based ideas for creation of advanced technologies and methodologies for the purpose of national defence.
4. explain why development in defence science invariably leads to advanced technological systems.

Course Content

The topics of study consists of the following:

1. Chemical defence.
2. Food for the soldier.
3. Mathematical optimization of military operations.
4. Mathematical approaches to computational modelling and simulation
5. Physics and defence for new defence technologies.
6. Laser applications
7. Biological defence.
8. Biological sensors
9. Cryptography.

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team / Individual	Assessment Rubrics
1. Midterm quiz 1	ILO 1, 2	Independent/creative thinking about national defence science	20	Individual	Multiple choice answers with 0 (incorrect) or 1 (correct answer) points
2. Midterm quiz2	ILO 2,3	Conceiving new ideas for solutions to defence and military challenges through scientific tools	20	Individual	Same as above
3. Final Exam	ILO 1, 2, 3, and 4	Application of math, physics, and biology in everyday life. Disease prevention and public health system; public health security and counter measures for bioterrorism. Creation of advanced technologies and methodologies for the purpose of national defence	60	Individual	Closed book multiple choice answers with 0 (incorrect) or 1 (correct answer) points
Total			100%		

Formative feedback

Formative feedback will be provided to students based on the performances in the online quizzes. The online quizzes provide an evaluation of how much a student and the class has learned. Based on these CAs, the instructor will provide feedback to students who are underperforming in the course. This way the students would have constant feedbacks from the instructor during the course so that they are well-prepared for the final examination and eventually pass the course by learning the concepts of defence science.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Self-study/ group study with help of online lectures	Self-study/ group studies with the help of online lecture content allows the student the freedom and flexibility to think about the subject matter deeply alongside active discussions with classmates on topics of defense science-based interests that spans across mathematics, physics, biology, and environment

Reading and References

1. Recorded lecture videos

Course Policies and Student Responsibilities

Absence Due to Medical or Other Reasons

If you are sick and unable to attend your class / Mid-terms, you have to:

1. Send an email to the instructor regarding the absence and request for a replacement class and make-up mid-terms.
2. Submit the original Medical Certificate* or official letter of excuse to administrator.
3. Attend the assigned replacement class (*subject to availability*) and make-up mid-terms.

* The medical certificate mentioned above should be issued in Singapore by a medical practitioner registered with the Singapore Medical Association.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Assoc. Prof. Ranjan Singh	SPMS-PAP-03-13	63162965	ranjans@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Physics and defence for new defense technologies	Understand the role of science and its importance to national defence (ILO 1, 4)	-Detailed video lectures -Video lecture slides for follow up -Midterm online quiz for students to access their understanding and grading criterion -Final close book examination for course assessment and grading
2	Biological defence		
3	Chemical defence		
4	Ionospheric Defence		
5	Biological sensors	Understand the need and types of bio detection techniques for biological defence (ILO 1, 2)	
6	Cryptography	Data encryption and decryption for secured communication (ILO 1, 3)	
7	Mathematical optimization of military operations	Discuss the methods for mathematical and physical science has been applied to the solutions of defence problems (ILO 1, 3)	
8	Fiber Optics and Laser for Advanced Applications	Fundamentals of fiber optics and laser for different applications (ILO 1, 3)	
9	Principles of Atmospheric Dispersion Modelling & Urban Meteorology	The usefulness and limitations of various basic scientific principles when applied in atmospheric sciences (ILO 1, 4)	