TIGERS TO TURTLES

CONSERVATION AND ECOLOGY IN BANGLADESH

Instructors:

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Location:

Sundarbans, Bangladesh

Course Introduction

Tropical Asia is one of the most important biodiversity hotspots in the world, and yet, it is one of the most vulnerable to climate change and sea level increases. The region is home to a large number of threatened and endemic species, making it critical to integrate assessment and planning for effective conservation in the context of climate change.

Located in a low-lying coastal region in Asia, Bangladesh lies in the transitional point between the Indo-Himalaya and Indo-Chinese sub-regions of the Orient. Within 147,570 square kilometers, it boasts a number of diverse ecosystems and an associated richness of unique plants and animals.

This two-week long field course will provide hands-on experience to participants in the ecology and conservation of unique wildlife species in two of the most biodiverse ecosystems within Bangladesh, and indeed, on Earth: Lawachara National Park, a tropical evergreen forest in northeastern Bangladesh and the

Location:

Lawachara, Bangladesh

Course Dates:

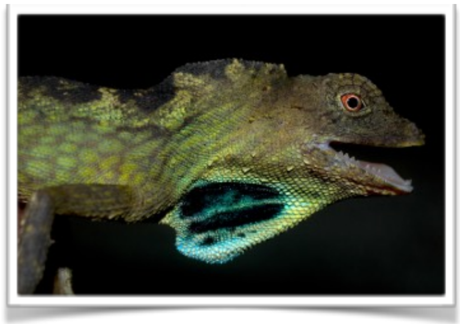
June 8 - June 20, 2019

Sundarbans Reserved Forest, the world's largest mangrove forest in southwestern Bangladesh.

Lawachara National Park is best known for its faunal diversity. It spans over 12 square kilometers and is categorized as semi-evergreen forest. The park is home to 6 primate species, including the lesser ape, the Endangered western hoolock gibbon (*Hoolock hoolock*). Lawachara also boasts a large variety of herpetofauna and avifauna with several new species for Bangladesh having been reported recently, some by the course instructor himself.

The Sundarbans is the world's largest contiguous mangrove forest (over 10,000 square kilometers in size) and it is shared between Bangladesh and India. It is also the world's only mangrove forest with tigers. It represents the largest remaining Bengal tiger (*Panthera tigris tigris*) habitat, and is home to ~ 750 animals. Other fauna include the spotted deer (*Axis axis*), estuarine crocodile (*Crocodylus porosus*), rhesus macaque (*Macaca mulatta*), king cobra (*Ophiophagus hannah*), leopard cat (*Prionailurus bengalensis*), wild boar (*Sus scrofa*), fishing cat (*Prionailurus viverrinus*), Indian python (*Python molurus*), and over 275 bird species. This mangrove forest is a UNESCO-declared world heritage site and is ratified by the Ramsar Convention on Wetlands.

Course Objectives



The overall objective of the course is to introduce participants to tropical wildlife, and their habitat, taxonomy, natural history and biogeography, with an emphasis on the conservation challenges and prospects faced by these animals. Additional topics covered are wildlife monitoring, evergreen forest ecology, mangrove forest and estuarine ecology, and applied conservation biology. During the course, theory will be delivered through lectures and in-house discussions, followed by hands-on activities to practice field methodologies. We will conduct field activities both during the day and at night. By the end of this course, participants can expect to be: a) able to recognize common wildlife species that live in the tropical evergreen and mangrove forests, b) familiar with methods used to conduct wildlife research in the tropics, c) able to plan, conduct and finish a wildlife related research project, d) able to keep a well-organized and accurate field journal, and e) comfortable living and working in basic conditions in remote locations.

Course Highlights

- Participate in a multi-day boat-led expedition into the Sundarbans Reserve Forest, the world's largest contiguous mangrove forest, with a chance to see endangered species like the Royal Bengal Tiger (*Panthera tigris tigris*), salt water crocodiles (*Crocodylus porosus*), the Ganges (*Platanista gangetica*) and Irrawaddy (*Orcaella brevirostris*) dolphins, and the critically endangered river terrapin (*Batagur baska*) endemic to the area. Nowhere else in the world can you find *P. t. tigris* in a mangrove habitat.

- Explore Lawachara National Park, containing semi-evergreen and mixed deciduous forests, home to the endangered western hoolock gibbon (*Hoolock hoolock*).

- Learn from a course instructor with diverse expertise in tropical biology field research, from albinism in the fishing cat (*Prionailurus viverrinus*) to the molecular phylogeny of South Asian Softshell Turtles. He has also conducted numerous herpetological surveys in the area, discovering two new lizard species sightings records in the Chittagong Hill Tracts of Bangladesh.

Course Credit

This course is available for credit for 3 units from Delta State University (DSU). Both DSU and external participants can register for credit. You do not have to be attending DSU to qualify for this option. The course is named BIO 492: Tropical Field Biology. The cost is $251 per credit X 3 credits = $753 + $9 intersession fees. Non Delta State University students will also need to register with the University, which has minimal registration fees. Registration for credit opens in the first week of November, as this course is considered part of the Spring semester.

While this course is offered for credit, it is not necessary that every student take it for credit - the choice is ultimately yours. If you live in the United States or Canada, which both utilize a similar credit system, you might want to include this course and the grade you receive on your official undergraduate transcript. We strongly recommend that students from schools outside of these two countries consult with their institutions before pursing a credit option to ensure that the credits can be applied toward their degree.

Credits will depend not only on coursework conducted in the field, but also on a written report due 2 weeks after return to your home country. This independent research paper can be tailored to suit your specific interests and is generally a 10-15 page project report on a conservation or biology-related aspect of one or more species of Bangladeshi wildlife.

NOTE: Taking the course for credit will incur additional costs paid directly to DSU. All courses taken for credit will receive a transcript with a letter grade. It is your responsibility to make sure that your university will allow you to transfer that grade and the credits so earned from DSU. Due to the high quality of the educational program provided at this university, this is typically not an obstacle to students.

Course Topics

Topic of Study	Activity	Topic Description
I. Introduction to Tropical Biodiversity		
Tropical Geography and Biogeography	Lecture	The definition “the Tropics”. Continents in evolution. The Ice Ages. New Archipelagos and land bridges. Tropical climate and soil.
Flora and Fauna	Lecture	Diversity of flora and fauna in different ecosystems. Water, heat and light: the winning formula in the tropics. A thousand strategies for survival.
Tropical Habitats	Lecture	Tropical forest profiles, mangrove ecology, wetlands and coral reefs biology, savanna and desert ecosystems. Habitat concepts and why these habitats are different.
Why do tropical regions harbor more species compared to temperate regions?	Research and discussion [Lambertini 2000]	We will discuss tropical flora and fauna as well as the biogeography and unique characteristics of different habitat types.
II. Mammalian Diversity		
Introduction to mammals, their origin and diversity	Lecture	What are mammals? Their origin and evolution as well as different adaptation strategies.
Mammalian Orders of the Indian Subcontinent	Lecture	Mammalian diversity in the tropical ecosystems. We will discuss the Orders most diverse in Indian Subcontinent, e.g. Primates, Chiroptera, Rodentia, Ceteacea, Carnivora, Insectivora, and Proboscidea.
Mammalian Natural History and Breeding Strategies	Lecture	We will examine the diversity of mating and breeding systems and their importance in an evolutionary context. We will also discuss natural history issues unique to Asian mammals.
Mammalian Survey Methods	Activity	Line transects: We will review the fundamentals of line transects, and potential sources of bias. Telemetry: When do we use telemetry? What type of data can we obtain through this method? Scan sampling: How to implement scan sampling in the field for behavioral research on primates. Camera trapping: How to use camera traps in a scientific way? What to avoid in their application?

Topic of Study	Activity	Topic Description
III. Avifauna		
Introduction to Birds, their Origin and Speciation	Lecture	Did birds evolve from dinosaurs? We will review the evolutionary origins of birds; participants will learn how new species arise, and speciation processes.
Avian Species Richness and Diversity	Lecture	Once we understand how new species are formed, we will analyze the present diversity with an emphasis on the Indian subcontinent.
Migration and Navigation. Avian Influenza	Lecture	Why do birds migrate? The patterns of migration and endogenous controls. Do birds use visual landmarks or the sun as their compass? We will also discuss how avian influenza is related to bird migration.
Avian Survey Methods	Activity	Point counts: Participants will learn the fundamentals of conducting point counts for birds. Mist nets: We will learn the situations under which it is more convenient to use mist nets, the principles of this method, and potential biases.
IV. Tropical Herpetofauna		
Introduction to Amphibians and Reptiles, Origin and Distribution	Lecture	Tetrapod relationships. Introduction to three living amphibian (caecilians, salamanders, frogs) and reptilian clades: turtles, archosaurs, lepidosaurs.
Amphibians and Reptiles: Evolutionary History and Adaptation	Lecture	We will emphasize their evolutionary history, including relationships of the major taxonomic groups to other taxa. What are the major adaptations as endothermic vertebrates?
Impact of Climate Change on the Diversity and Population of Tropical Herpetofauna	Lecture	Identify the major taxonomic groups of herpetofauna in Bangladesh and discuss the impact of climate change on some important species.
Herpetofaunal Survey Methods	Activity	Visual encounter survey (VES): We will implement VES in tropical forests. We will discuss its advantages, principles, and potential biases. Amphibian auditory surveys, and artificial cover surveys: Participants will learn the fundamentals of amphibians auditory surveys and artificial cover surveys of herpetofauna, their advantages, principles, and potential biases.

Topic of Study	Activity	Topic Description
V. Evergreen Forest Ecology		
Introduction to Evergreen Forests of Bangladesh	Lecture	Forested habitats of Bangladesh. Forest biodiversity and conservation. Productivity of the forest ecosystem.
Major Protected Areas and Prominent Wildlife Species	Lecture	Introduction to the protected areas of Bangladesh. Wildlife diversity in different protected areas. Wildlife management in different 'bio-ecological zones' of the country.
Which methods are most effective for surveying tropical wildlife? Case study: herpetofauna.	Research article discussion [Doan 2003]	We will discuss a classic scientific paper on how we can obtain different results by using different survey methods, and how to select an appropriate method for a specific survey.
Habitat surveys in the evergreen forests	Activity	<u>Habitat survey</u>: Participants will learn the techniques used to survey habitat, and the importance of relating habitat features to wildlife species presence, abundance, diversity, etc.
VI. Mangrove Forest Dynamics		
An Introduction to the Largest Mangrove Forest of the World	Lecture	What is a 'mangrove forest'? Ecology and natural resources of the Sundarbans mangrove system.
Flora and Fauna of Mangrove Ecosystems	Lecture	Physical environment, mangrove vegetation, floral diversity and composition, natural regeneration, faunal diversity and composition, wildlife sanctuaries, conservation management.
Impacts of Climate Change	Research article discussion [Boyd et al. 2005]	How much effect might climate change have on tropical wildlife species? We will review a research article on the combined effect of climate change and sea level rise and its impact on tropical biodiversity.
Habitat Surveys in Mangrove Forests	Activity	<u>Habitat survey</u>: We will demonstrate to participants the feasible habitat survey/ study techniques in the mangrove forest as an unusual terrain.
VII. Conservation and Policy Issues		
Management Actions and Conservation Strategies	Lecture	We will review case studies from Bangladesh on how scientific knowledge has helped to improve species management. Participatory and community based conservation examples.

Topic of Study	Activity	Topic Description
Current State of Conservation Practices in Bangladesh	Guest Lecture	We will invite a leading wildlife professional from Bangladesh and will listen to his/her views on current conservation practices in the country.
Safeguarding National Resources	Research article discussion [Reza 2004]	Are we doing enough? We will discuss an article on natural resources management in Bangladesh and discuss lessons learned.
Importance of Wildlife Conservation in Bangladesh	Panel discussion	We will invite a few local students as well as conservation professionals to exchange views on the conservation of biodiversity.

Daily Schedule

Below is the daily schedule of activities for the field course. Participants should be aware that the timing of activities is subject to change due to weather or other unforeseen difficulties, or unanticipated opportunities. We will do our best to stick to the following schedule, but a good measure of flexibility will allow us to complete all of the planned activities while remaining adaptable to the constantly changing conditions in the field.

Date	Activity	Description
8 June	Arrive in Dhaka. Settle-in, stay overnight in a hotel, get ready for journey to Lawachara National Park (LNP)	
9 June	*Morning*: Depart from Dhaka to Sreemangal	Journey by bus/reserved van
	Late afternoon: - Arrive at Lawachara National Park - Transfer to the Rest House and settle in	Start keeping field journal
	Night [Activities]: - Ice-breakers/ name game - Brief tour of the rest house and surrounding areas - Safety briefing and navigation practices	Prepare equipment for next day

Date	Activity	Description
10 June	*Morning [Activities]*: - Explore and navigate through Lawachara NP - Set up camera traps and become familiar with the forest trail system - Implement line transect and visual encounter surveys *Afternoon [Lectures]:* - Introduction to 'the tropics', biogeography - The flora and fauna of the tropics - Tropical habitats and diversity *Night [Activities]*: - Night survey for wildlife - Keeping a field journal	Field activity data sheet Transect survey data sheet Assigned Reading: *Lambertini 2000. A Naturalist's Guide to the Tropics* Chapter 1: Tropical biogeography, Chapter 4: The Flora Chapter 5: The Fauna
11 June	*Morning [Activities]*: - Set up and operate mist nets - Point counts survey for birds - Scan sampling of commonly observed primates (eg. Rhesus Macaque/Capped Langur) *Afternoon [Lectures]:* - Introduction to mammals - Mammalian Orders - Mammalian natural history and breeding strategies - Mammalian species diversity. Focus: Lawachara NP and Sundarbans mangrove forest - Quiz 1 - *Discussion of the assigned readings* *Night [Activities]*: - Slow loris survey - Amphibian auditory survey - Chiropteran survey using mist nets* - Keeping a field journal	Mist net data sheet Transect survey data sheet Scan sampling data sheet Quiz 1: Tropical biodiversity and biogeography; Mammalian Orders, and natural history. Updating the field journal

Date	Activity	Description
12 June	*Morning [Activities]*: - Visit Baikka Beel (a migratory bird site) *Afternoon [Activities]*: - Camera trap data collection and initial analysis - Radio telemetry demonstrations *Night [Lectures]*: - Introduction to birds, their origin and speciation - General introduction of bird life in Bangladesh - Avian species richness and diversity, bird migration, avian influenza - Keeping a field journal	Line transect data sheet
13 June	*Morning*: - Return back to Dhaka *Night [Lectures]*: - Introduction to amphibians and reptiles, evolution and adaptation - Herpetofuanal species diversity and impact of climate change - *Research article discussion* - Keeping a field journal	<u>Assigned Reading:</u> *Doan 2003. Forest herpetofauna survey methods* Updating the field journal
14 June	*Morning [Activities]*: - Observation of wildlife at Jahangirnagar University campus - Seminar at Jahangirnagar University and student interaction *Afternoon [Activities]*: - Quiz 2 - Flight to Khulna	Quiz 2: Avifaunal diversity, migration; and herpetofuana.

Date	Activity	Description
15 June	*Early Morning*: - Travel towards Katka-Kachikhali through Sundarbans - Lecture on board: Introduction to mangrove, flora and fauna and their adaptation - *Research Article Discussion on board* Afternoon *[Activities]:* - Visual encounter survey of wildlife from the boat *Night*: - Enjoyment of magrove forests at night - Keeping field journal	Assigned Reading: *Boyd et al. 2005. Climate change* Updating the field journal
16 June	*Morning [Activities]*: - Point counts survey & bird watching - Setting up camera traps *Afternoon [Activities]*: - Habitat survey at Katka-Kochikhali - Line transect surveys *Night [Lecture]*: - Flora and fauna of mangroves - Impact of climate change & sea level rise (SLR) - Quiz 3 - Keeping field journal	Point counts survey sheet Habitat survey data sheet Line transects data sheet Quiz 3: Mangrove forest ecosystems and biodiversity Updating the field journal
17 June	*Morning [Activities]*: - Mist netting in Katka-Kachikhali area - Camera trap data collection *Afternoon [Activities]*: - Visual encounter survey - Line transect survey *Night [Lecture]*: - *Research article discussion* - Forest types in Bangladesh, e.g. evergreen and mangrove forests; protected areas - Keeping a field journal Travel towards Khulna	*Assigned Reading* *Reza 2004. Natural resources management*

Date	Activity	Description
18 June	*Morning [Lecture on board]*: - Management actions and conservation strategies - Panel discussion on biodiversity conservation prospect in Bangladesh - Quiz 4 Flight to Dhaka	Quiz 4: Forest types, species diversity, protected areas, and conservation management
19 June	Spare day in Dhaka - Local activities, which might include visiting Dhaka Zoo if possible - Free time, rest and/or socialization with locals - Updating the field journal	
20 June	Fly back home	

Note: * Handling bats requires a rabies vaccination and special permission from the instructor prior to taking the course.

Course Work

1. Field Journal (100 pts)

A field journal is the essential tool for all field biologists, regardless of whether they are ornithologists, herpetologists, botanists, or focused on other wildlife. Unlike data sheets, on your field journal you should (and must) be as detailed as possible. Think about it as your data bank, where you can always go back and check if you are missing something important for your analysis. If your field journal is complete, you will earn 100 points (which is what we expect). We will evaluate the following elements on your field journal, each one of them worth a different number of points:

A. Date, location name and geographical coordinates.

B. Location description: write a brief description of the local vegetation (height estimation, general description of the canopy and understory), the weather (cloudy, sunny, raining, windy, wind conditions and temperature are a plus), description of wildlife activity and behavior (resting, swimming, flying, running, walking, etc.), and any changes you notice since the last time you were there.

C. Starting time and ending time.

D. Records of your observations: write about the wildlife witnessed (species, individuals, activities they were engaging in), the methods used to make observations, and the wildlife species' behaviors (eating, nesting, roosting, grooming, flying away).

The field journal will be reviewed every 5 days, and participants will have to submit it at the end of the course for the final review. Most days, participants will have some time at night free to complete their journals, except when we have quizzes or discussions.

2. *Species List (50 points)*

As students make detailed observations of flora and fauna in the field, they are expected to input this data into a provided digital file. Not only will this provide practice focusing on key characteristics for identification, but will also contribute to a cumulative database of species encounters at Lawachara and Sundarbans. FPI will provide an Excel template to use for recording species observations. Each student will submit their progress mid-course to gain instructor feedback, then later submit the complete list at the end of the course.

3. *Participation in Discussions (100 points)*

We will discuss research paper/s every time we finish a section of the course. Participants will be asked to read the articles before their arrival in Bangladesh. These discussions have three objectives: (1) to reinforce the knowledge acquired on lectures and field practices, (2) to maximize the participant's analytical thinking with applied knowledge, and (3) to contrast ideas, points of view, and critical analyses of the methods, biases, limits, and contributions of the research paper, so participants can apply the information reviewed in the lectures. Sometimes it is easier to learn through feedback, so instructors will be always encouraging participants to engage in the discussion. The number of points discussions will earn are shown in the table below.

4. *Participation in Field Activities (200 points):*

Since field activities are planned to put into practice acquired knowledge, it is very important for participants to participate in the course. We will take into account the following: interest in learning how to perform surveys, interest in the purpose of equipment and how to use it, interest in the biology of the species found in the field, comments or questions about the methods, contribution to the data sampling, the quality of the obtained data and reports, and a positive attitude. Participants will also have to take part in all survey tasks, such as recording data on data sheets, using the equipment, identifying species with field guides, setting up mist nets, etc.

5. *Quizzes (100 pts each, 400 points total)*

Whether you are currently a student and accustomed to taking quizzes, or if you can't remember the last time you took one, these are experiences to be enjoyed and not a cause of anxiety. Quizzes are designed with each specific batch of students in mind to reflect the discoveries they make each day on this specific course. Participants will take periodic quizzes throughout the course that will cover the materials seen and learned in the preceding 2-3 days. These quizzes are meant to be interactive, visual, and based on what you see in your specific course, not just the theoretical lectures you might listen to. They are not going to involve lengthy essays but shorter and quicker questions. The quiz shouldn't take longer than 15 minutes or so to complete each time.

6. *Field Activity Reports (150 points)*

Obtaining data is one of the most important parts of every survey. So, for every field activity we will provide participants with data sheets to fill out and return to the instructors at the end of each field activity. Instructors will evaluate if participants complete the data sheets.

Reading List

Topic	General Reading List
Mammals	IUCN Bangladesh. 2015. *Red List of Bangladesh Volume 2: Mammals*. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+232.
Birds	IUCN Bangladesh. 2015. *Red List of Bangladesh Volume 3: Birds*. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+676.
Reptiles and Amphibians	IUCN Bangladesh. 2015. *Red List of Bangladesh Volume 4: Reptiles and Amphibians*. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+320.
Bio-ecological zones	Nishat, A., Huq, S.M.I., Barua, S.P., Reza, A.H.M.A. and Khan, A.S.M. (eds.). 2002. *Bio-ecological Zones of Bangladesh*. IUCN-The World Conservation Union, Bangladesh Country Office. XII+ 141 pp.
Amphibians	Reza, A.H.M.A. 2014. Status, distribution and conservation of the Amphibians of Bangladesh. In: Conservation Biology of Amphibians of Asia: *Status of Conservation and Decline of Amphibian: Eastern Hemisphere*. (Edited by Heatwole, H. and Das, I.). Natural History Publications (Borneo), Kota Kinabalu, Malaysia.
Birds	Alam, A.B.M.S., Azmiri, K.Z., Ahmed, S., Rahman, M.Z. 2015. A field manual for the study of wild birds. IUCN-The World Conservation Union, Bangladesh Country Office. V+ 60pp.
Mammals	Islam, M.A., Mohsanin, S., Chowdhury, G.W., Chowdhury, S.U., Aziz, M.A., Uddin M., Saif, S., Chakma, S., Akter, R., Jahan, I., and Azam, I. 2011. Current status of Asian Elephants in Bangladesh. *Gajah* 35: 21-24.
Birds	Thompson, P.M., Chowdhury, S.U., Haque, E.U., Khan, M.M.H., and Halder, R. 2014. Notable birds records from Bangladesh from July 2002 to July 2013. *Forktail* 30: 50-65.
Herpetofauna	Hasan, M.K. and Feeroz, M.M. 2014. Species diversity and habitat preference of amphibians in six protected areas of Bangladesh. *Bangladesh Journal of zoology* 42(1): 105-116.

Mammals	Feldhamer, G.A., Drickamer, L.C., Vessey, S.H. and Merritt, J.F. 2007. *Mammalogy: adaptation, diversity and ecology*. 3rd edition. McGraw-Hill Companies Inc., New York.
Birds	Chowdhury, S.U., Diyan, M.A.A., Zockler, C., Faysal, M., and Lemke, H.W. 2014. A survey of shorebirds in the Sundarbans of Bangladesh. Stilt 66: 10-13.

Required Readings for Discussions

Lambertini, M. 2000. *A Naturalist's Guide to the Tropics*. University of Chicago Press, Chicago, IL, pp. 312.
Doan, T.M. 2003. Which methods are most effective for surveying rain forest herpetofauna? *Journal of Herpetology* 37: 72–81.
Boyd, H., Minton, C., and Rogers, K. 2005. Has the timing of snowmelt in eastern Siberia affected the numbers of juvenile waders wintering in southeast Australia? *The Stilt* 48: 2-9.
Reza, A.H.M.A. 2004. Natural resources management in Bangladesh: Linking national priority to Global perspective. *Tigerpaper.* xxxi (2): 10-16.

Grading Criteria

Individual and group assignments will be assessed according to the following point schedule:

Assessment Item	Description	Points
Ongoing Course Assignments (100 points)		
Field journal	Participants will write the date and place of the current activities, as well as a brief description of the site conditions and registered species.	50
Species List	A full sightings list of everything you have seen	50
Field Activity Data and Reports		200
Discussions		100
Participation in field activities		200
Quiz 1 (Due Dec 14)	Tropical biodiversity and biogeography; Mammalian Orders, and natural history.	100
Quiz 2 (Due Dec 17)	Avifaunal diversity, migration; and herpetofuana diversity, evolution and conservation.	100
Quiz 3 (Due Dec 19)	Mangrove forests ecosystem and biodiversity, and conservation	100
Quiz 4 (Due Dec 21)	Forest types, species diversity, protected areas, and conservation management	100
Total points		**1000**

To convert final grade percentages to letter grades that will appear on a transcript, the following grading scheme will be applied:

Letter grade	Percentage	Letter grade	Percentage
A	92.5 ≦ % < 100	C+	77.5 ≦ % < 80.0
A-	90.0 ≦ % < 92.5	C	72.5 ≦ % < 77.5
B+	87.5 ≦ % < 90.0	C-	70.0 ≦ % < 72.5
B+	82.5 ≦ % < 87.5	D+	67.5 ≦ % < 70.0
B-	80.0 ≦ % < 82.5	D	62.5 ≦ % < 67.5
		D-	60.0 ≦ % < 62.5
		F	% < 60.0