Course Syllabus

EVS 6194 Applied Soil Biology
SWS 4303 Soil Microbiology
Spring 2011

Instructor: Krish (Jay) Jayachandran
Soil Microbiologist/Soil Scientist
Earth and Environment
ECS 339

Place: GC 274
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Office Hours: 10-12 MW

A COURSE INTRODUCTION

A1 Text: Soil Microbiology: An Exploratory Approach, Mark Coyne
Delmar Publishers.

A2 References: Other readings will be assigned from journal articles and books.

A3 Grading and exams

<table>
<thead>
<tr>
<th>Points</th>
<th>First week of February</th>
<th>First week of March</th>
<th>Third week of April (Final)</th>
<th>Quizzes</th>
<th>Journal Articles Discussion &amp; Participation</th>
<th>Each Absence/Sleep/Talk</th>
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<tbody>
<tr>
<td>100 (25%)</td>
<td>100 (25%)</td>
<td>120 (30%)</td>
<td>40 (10%)</td>
<td>40 (10%)</td>
<td>40 (10%)</td>
<td>-1%</td>
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If you miss class due to a valid, documented extenuating circumstance, it will not count as an absence. Examples of valid absences include: (a) family member serious illness or death; (b) official academic/athletic event (e.g. field trip); or (c) recommendation from an MD.

Late assignments/exams will not be accepted except when due to the above-cited circumstances. Examinations will have subjective and objective sections. The Final will be a cumulative. Please be aware that definitions will be expected in the examinations. Quizzes will test specific points covered during recent lectures. Make-up quizzes will not be given - rather if you miss a quiz during an excused absence I will use an average of all your other quizzes to calculate a replacement score. Participation points will be awarded for attentiveness and positive contribution to class discussions. Conversely, points will be lost for unexcused absences, class disruptions, etc.

Method of instruction is traditional lectures mixed with student discussion on relevant journal articles.

Your Final Letter Grade will be 94-100 A, 91-93 A-, 87-90 B+, 84-96 B, 81-83 B-, 77-80 C+, 74-76 C, 71-73 C-, 61-70 D, 0-60 F.
A4 This course will provide you with an understanding of soil organisms and give you an opportunity to become familiar with the activities of these organisms in relation to human existence. Techniques and methods of isolation, enumeration, and means of studying transformations will be emphasized. Relevant research articles will be discussed during regular lecture hours.

A5 Overview of importance — Why study soil microorganisms?
A6 Historical accounts and the “Golden Age” of soil microbiology.

B SOIL AS A BIOLOGICAL ENVIRONMENT
B1 Composition — minerals, organic fractions, charge, size relationships
B2 Important variables — moisture tensions atmosphere, temperature, humus, pH
B3 The Soil Biota

C METABOLIC REQUIREMENTS AND GROWTH
C1 Water
C2 The five essentials – Energy source (electron donor), Electron acceptor, Carbon source, Minerals, and Growth factors

C3 Growth curves
C4 Dilution plate counts

D BACTERIA
D1 Naming and General Taxonomy
D2 Morphological and Nutritional Classification
D3 Geochemical groups

E ACTINOMYCETES
E1 What are they?
E2 Classification and Taxonomy
E3 Conidia
E4 Role in the Soil

F FUNGI
F1 Selective Media and Methods of Investigation
F2 Types of Organisms Present
F3 Spore and Hyphae Separation; Bacterial and Fungal Spore Comparison
F4 Role in the Soil

G ALGAE
G1 Location and Significance
G2 Kinds of Soil Algae
G3 Lichens
H  Viruses
H1  Hosts
H2  Presence in Soil
H3  Activity and Scope

I  PROTOZOA
I1  Most-Probable Number (MPN) Technique
I2  How to identify
I3  Motility
I4  Environmental Influences and Significance

J  NONPROTOZOA FAUNA
J1  Neglected group
J2  Nematodes
J3  Earthworms

K  METHODS FOR THE STUDY OF SOIL ECOLOGY
K1  Direct methods
K2  Cultural methods
K3  Product transformations

L  DECOMPOSITION OF ORGANIC MATTER IN SOIL
L1  Carbon cycle
L2  Organics
L3  Assimilation
L4  Mineralization and Immobilization of Nitrogen
L5  Management of Soil Organic Matter

M  PLANT COMPONENT BREAKDOWN
M1  Cellulose
M2  Starch
M3  Hemicellulose
M4  Other Polysaccharides, Proteins, and Lipids

N  THE RHIZOSPHERE AND ORGANISMAL DISTRIBUTION WITHIN THE SOIL
N1  Exudates
N2  R/S Ratio
N3  Beneficial and Harmful effects
N4  Pathogenic Relationships
O MYCORRHIZAE
O1 Ectomycorrhizae
O2 Endomycorrhizae
O3 Nutrients and Carbon Flow

P NITROGEN FIXATION
P1 Nonsymbiotic
P2 Symbiotic
P3 The Symbioses
P4 Inoculation and Biochemistry

Q NITRIFICATION
Q1 Historical – Schloesing and Muntz, Warington, and Winogradsky
Q2 Nitrifying bacteria
Q3 Environmental influences
Q4 Nitrification inhibitors

R DENITRIFICATION
R1 Organisms involved
R2 Biochemistry and End-Products
R3 Environmental factors

S MICROBIAL TRANSFORMATIONS OF PHOSPHORUS AND SULFUR
S1 Organic and inorganic P
S2 Phosphatases
S3 Oxidation and Reduction of Sulfur
S4 Organic forms of S

T MICROBIAL TRANSFORMATIONS OF METALS
T1 Iron transformations
T2 Pipe corrosion
T3 Others

U RECALCITRANT MOLECULES
U1 Pesticides
U2 Persistence and Microbial Degradation
U3 Fate and Transport

Please ask questions in class as this will greatly add to the discussion and learning process and let me know at anytime throughout the term how I can be of help.