

UWU CC Appr 10/26/04 Senate Appr 12/7/04

04-13c

Curriculum Proposal Cover Sheet

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Form as requested. Use a separate cover sheet for each

Action of CBRN Materials

AS 30000 04-13c

College Curriculum Committee

SYLLABUS OF RECORD

I. Catalog Description

SDR 211 Interaction of CBRN Materials with Biological Systems and PCR Technology

3 class hours

3 lab hours

5 credit hours

(3c-3l-5cr)

Prerequisites: SDR 111 and permission of instructor and local, state or federal agency/organization authorization.

Level 2 biology designed to provide the intermediate level first year student with

knowledge, skills, and practical capabilities to effectively identify bacteria, viruses,

4. Evaluate selected microorganisms based on specific diagnostic procedures and describe the general properties of eukaryotic pathogens.

5. Differentiate potential bioterrorism agents on the basis of genome characteristics, morphologies of Gram reaction and immunological properties.
6. Review the fundamentals of the structure and replication of DNA, the process of transcription, and translation, and the principles of recombinant DNA technology.
7. Explain how DNA technology is applied for the production of a wide variety of

genetically modified organisms, pharmaceutical products, vaccines.

8. Eukaryotic chromosome structure (chromatin/nucleosome)

9. Structure and function of organelles

B. Study Of Infectious Agents, Toxins And Engineered Biological Weapons

(6 hours)

1. Importance of microorganisms and different biological agents Infectious agents

2. Bacteria genetic variation, mechanisms of genetic variation

3. Bacterial nutrition and metabolism, bioactive antioxidants supplements

4. Bacterial classification based on ecological relationships

5. Bacterial parasitism, receptor-associated responses, bacterial toxins, genetically engineered toxins as biological warfare agents.

6. Virus and agents characteristics, infection process, emerging virus, C. bot.

genetically engineered virus.

7. Classification of bioterrorism agents and the level of laboratory risk associated with those agents.

8. Detection of biological agents, laboratory diagnosis, clinical diagnosis

10. Describe the role of *Cryptosporidium parvum* in cryptosporidiosis and its

11. Identify how contaminated water supplies and food cause the spread of the protozoan agent *Cryptosporidium parvum*, and its significance as a potential biological weapon.

EXAM I (1 hour)

D. Introduction To Nonspecific Defense And Specific Defense Mechanisms Of The Host (6 Hours)

1. Describe the mechanical and chemical defenses that are associated with non-specific resistance.

2. Identify the role of phagocytes, inflammation, and antimicrobial substances

against pathogens.

3. Assess the differences between immunity and nonspecific resistance.
4. Describe the important control mechanisms and organs of the immune system.
5. Describe the role of lymphocytes in specific immune function.
6. Differentiate humoral and cellular immunity.
7. Describe the mechanisms involved in immune gene regulation and the role of recombinant DNA technology in vaccine production.

E. DNA Replication, Mutation, And Polymerase Chain Reaction (6 Hours)

1. Describe the principles of DNA replication.

2. State function of different enzymes associated with DNA replication.

F. Central Dogma of Molecular Biology: Principles of Transcription, mRNA Processing, and Translation (4 hours)

1. Describe the flow of genetic information from DNA to protein.
2. Describe the process of transcription, identify the important steps, role of different RNA involved and RNA polymerase in the transcription process _____

3. Structure of immature and mature mRNA and the important steps involved in mRNA processing _____

4. Role of each macromolecule in the translation process, protein synthesis and the

genetic code.

G. Recombinant DNA Technology Methods, Principles And Application As It Relates To Potential Bio-Warfare Agents (8 hours)

1. State the important steps in recombinant DNA technology and its application in

4. Nucleic acid purification from engineered organisms (above 3) (2 hours)
5. RNA purification from infected and healthy tissue (2 hours)
6. PCR experiments from purified nucleic acids from 4 and 5 above (4 hours)
7. Identification of serum proteins and establishment of evolutionary relationship (4 hours)
8. Western blot techniques, ELISA, and hand held assays experiments (4 hours)
9. PCR experiments as it relates to forensic (Conventional PCR) (4 hours)
10. REAL-TIME PCR experiments (4 hours)

There will be two exams in the course. A mid-term during the middle of the semester and

... biological hazards and conduct a proper response call. The student will apply

prior training and education in response to biological incidents. Each student will construct a portfolio that documents his or her response to the capstone event. The format for the portfolio report will be similar to the format used for real incident reports.

Grading Scale: Grades will be determined from the total points obtained divided by the total possible points, and expressed on a percentage scale.

Supplemental Books and Readings:

Boyd, R. *Basic Medical Microbiology*; 5th ed.; Little, Brown and Company: Boston, MA, 1995.

Burden, D. W.; Whitney, D.B. *Biotechnology: Proteins to PCR*; Birkhauser: Boston, 1995.

Chrispeels, M. J.; Sadava, D. E. *Plants, Genes, and Crop Biotechnology*, 2nd ed.; Jones and Bartlett Publishers: Sudbury, MA, 2003.

Wright, D. Hunt, D. Eds. *Biological Safety: Principles and Practices*, 2nd ed.; ASM

IX. Bibliography

Alberts, B.; Bray, D.; Lewis, J.; Raff, M.; Roberts, K.; Watson, D.J. *Molecular Biology of The Cell*; Garland Publishing: New York, 1994.

August, J.T.; Anders, M.W.; Murad, F.; Coyle, T. J. *Gene Therapy* Vol. 40 of *Advances in Pharmacology*; Academic Press: New York, 1997.

Brown, T.A. *Gene Cloning*; Chapman and Hall: London, 1990.

Press: New York, 1996.

Calladine C.; Drew, H. *Understanding DNA*; Academic Press: New York, 1997.

Chrispeels, M.J.; Sadava, D.E. *Plants, Genes and Agriculture*; Jones and Barlett Publishers: Sudbury, MA, 1994.

Glick, B.R.; Pasternak, J.J. *Molecular Biotechnology: Principles of Recombinant DNA*; ASM Press: Washington, DC, 1994.

Heldt, H.-W. *Plant Biochemistry and Molecular Biology*; Oxford University Press:

Kenyon, C. If birds can fly, why can't we? Homeotic genes and evolution. *Cell* 1994, 78: 175-180.

Wolfe, M. *Gene Transfer and Expression*. W.H. Freeman and Company, New York.

1990.

Law, T. *Journal of Embryology and Experimental Morphology*. 1990, 107: 1-10.

COURSE ANALYSIS QUESTIONNAIRE

A. Details of the Course

A1. How does this course fit into the programs of the department? For which students is the

course designed? (majors, students in other majors, liberal studies). Explain why this content cannot be incorporated into an existing course.

This course is one of the required courses for students in the BS in Natural science with a Science for Disaster Response (SDR) concentration. It is not intended to be a Liberal

Studies course. This course is designed for first responders – the emergency personnel

- A4. Is this course to be a dual-level course? If so, please note that the graduate approval occurs after the undergraduate.

This course is not a dual level course.

- A5. If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student? Who will make this determination and by what procedures?

This course is not to be taken for variable credit.

- A6. Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

To the best of our knowledge, this course and its intended degree program are unique in the United States. This lack of specific scientific education for emergency first responders at an accredited institution was one of the primary motivating factors for the National Guard Bureau (NGB) to approach IUP to develop this course.

- A7. Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation.

The Department of Defense (DoD) Combating Terrorism Technology Support Office (CTTSO) and the Technical Support Working Group (TSWG) appropriated three years of funding for the Weapons of Mass Destruction-Response Element Advanced Laboratory Training and Indoctrination (WMD-REALITI) program. The purpose of this program is to develop an accredited (professional, academic, or both) education, training, and research program designed to provide the novice, intermediate, apprentice, and advanced laboratory technicians with knowledge, skills, and abilities (KSA) comparable to those

Support Teams (WMD-CST), other U.S. Government WMD and homeland security response elements, state, and local civilian WMD, and homeland security response elements, and related emergency planners. IUP was contracted to develop the four modules of courses (novice, intermediate, apprentice, and advanced) over the three years of the WMD-REALITI program. This course is part of the Intermediate module. The first year was funded for \$170.317, the second year for \$441.445, and the third year for

The intended audience of SDR 231 (active first responders in the WMD community) may require intensive delivery and specific educational objectives that are not met by existing IUP courses.

- B3. Will this course be cross-listed with other departments? If so, please summarize the department representatives' discussions concerning the course and indicate how consistency will be maintained across departments.

This course is not cross-listed.

- B4. Will seats in this course be made available to students in the School of Continuing Education?

Only if the Continuing Education students have been accepted in the SDR program.

C. Implementation

- C1. Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how this course will fit into the schedule(s) of current faculty. What will be taught less frequently or in fewer sections to make this possible? Please specify how preparation and equated workload will be assigned for this course.

Yes, faculty resources are adequate because of external funding. If no external funding is available, then additional faculty resources will be required. This course will be counted as six (6) workload hours towards the workload for one faculty member, or as credits split appropriately among the workloads of each of three faculty members who team

following areas, skill sets, and certificates. The qualified faculty member will have experience in Bio safety training, immunological techniques, and demonstrated three to five years of conducting training at a facility using biological materials.

C2. What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following:

*Space

*Equipment

*Laboratory Supplies and other Consumable Goods

Space: For academic year 2002/2003, Weyandt Hall will suffice, but future offerings will require a separate facility. The DoD is covering the cost of this facility. John P. Murtha has arranged to have ten million dollars of DoD money

Library: Concurrent Technologies Corporation (CTC), on behalf of the National Guard Bureau, has packaged materials needed by the students. In the event that the course is not funded by external money, students will purchase the required text at a local copying business, such as Pro Packet. Additional materials will be available on-line or purchase optional supplemental text at the Co-op store.

Travel Funds: not applicable

- C3. Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)

Yes. So far, all resources for this course have been funded by the DOD and the National Guard Bureau (NGB). Contract with these agencies are expected to continue for several years. However, IUP is preparing to support this course when it is independent of

What is the justification for this planned number of students?

laboratory exercises in 1 credit laboratory courses. The 5 credits for this course have been acknowledged and approved by the College of Natural Sciences and Mathematics. Please see Appendix A for letter from Ms. Ola Kaniasty, Assistant Dean of the College of Natural Sciences and Mathematics and Chair of the College Curriculum Committee.