###### **MO1903**

###### Mathematics for ISSO Space Systems Operations Specialization

###### November-December (AY04 Q1), 2003

**SYLLABUS**

 The course is a brief survey of the following topics: Ordinary Linear Differential Equations and their Applications, Complex Numbers, Fourier Series and the Fourier Transform Specific goals for each topic are provided in the attached Course Objectives.

Instructor: Bard Mansager, Office G364, 656-2695, bkmansag@nps.navy.mil

 Office Hours Posted or by appointment,

Text: **Differential Equations** (Second Edition), by Richard Bronson, Schaum's

 Outlines, McGraw-Hill, 1973. (**DE**)

 **Fourier Analysis** by Carroll Wilde and Bard Mansager. Class Notes,

1992. (**FA**) Provided in class.

 **Applied Fourier Analysis** by H.P. Hsu. College Outline Series, Harcourt

Brace **a**nd Jovanovich, 1984. (**AFA**) Provided in class.

 **Mathematics Tables**, Mathematics Department, Naval Postgraduate

School. (Optional)

 “Electronic Communications Systems and the Frequency Domain: An

 Illustrated Primer for C3 Students” by Bruce Kevin Babcock, NPS

 Masters thesis, June 1990. Provided in class. (Optional)

Hours Topic

 6 1st Order ODEs

 2 Theory of ODEs

1. 2nd Order ODEs

5 Complex Numbers

 7 Fourier Series

1. Fourier Transforms

1 Review

 3 Exams

 1 Holiday

 36 Total

Exams: Use of Math Dept. Tables and one 8.5”x11” piece of paper permitted.

Grade: 60% Quizzes (3)

 40% Comprehensive Final

Lsn Topic Assignment

1 Basic Concepts; Classifications READ: **DE**, Chap 1 , p 1-2.

 of First order DEs Solved Problems: 1.1 – 1.3, 1.5, 1.7,

 1.9, 1.11, 1.13, p 3-6.

 Supp Problems: 1.14 - 1.54 (even), p 6-7.

2 Separable, First Order DEs READ: **DE**, Chap 2, p 8-9(exclude

 Bernoulli, Homogeneous Equations) Chap

 3, p. 14-15 (exclude Reduction of

 Homogeneous Eqns)

 Solved Problems: 2.1-2.7, 2.10-2.11, p 9-

 12. 3.1-3.8, p 15-18

 Supp Problems: p 13, 2.15-2.25, 2.26,

 2.28; p.23, 3.24, 3.39, 3.40, 3.45

3 Exact First Order DEs READ: **DE**, Chap 4 (exclude

 Integrating Factors), p 24

 Solved Problems: p 26-30, 4.1-4.13

 Supp Problems: p. 33; 4.24-4.27, 4.59,

 4.60.

4Linear First Order DEs READ: **DE**, Chap 5 (exclude Reduction of

 Bernoulli Eqns), p. 35.

 Solved Problems: p. 35-39; 5.1-5.15

 Supp Problems: p. 41; 5.20-5.36 (even),

 5.50- 52.

5 Applications of First Order READ: **DE**, Chap 6, p. 43

 DEs (Growth/Decay, Solved Problems: 6.1-6.6, 6.8-6.10, p 46-

 Temperature Problems) 52.

 Supp Problems: 6.26, 6.31, 6.33, 6.36,

 6.45, 6.48, p 60-63

6Applications of First Order READ: **DE**, Chap 6, p 43-45.

 DEs Falling Body Problems, Solved Problems: 6.11-6.13, 6.19, 6.20,

 Electrical Circuits 6.22, p 58-59.

 Supp Problems: 6.51, 6.58, 6.71, 6.76,

 p 63-65.

## **7** Linear DEs:Theory of Solutions READ: **DE** Chap 7 p 67-68

 Solved Problems: 7.1-7.3, 7.5-7.12, 7.16-

 7.23 p. 68-73

 Supp Problems: 7.33-7.35, 7.36-7.54

 (even), 7.65-7.67 p. 75-76.

8 Second Order Linear READ: **DE** Chap 8. P 77-78.

 Homogeneous DEs Solved Problems: 8.1-8.15, p 78-81.

 with constant coefficients Supp Problems: 8.17, 8.23, 8.27, 8.31, 8.35,

 8.39, 8.43.

9 Nth Order Linerar Homogeneous READ: **DE** Chap 9 p83-84

 with Constant Coefficients Solved Problems: 9.1-9.8, p84-85

10Undetermined Coefficients READ: **DE** Chap 10 p 88-89.

 Solved Problems: 10.1-10.3 p 89-90.

 Supp Problems: 10.15, 10.19, 10.21, 10.44,

 10.49

11 Variation of Parameters READ: **DE** Chap 11

 Solved Problems: 11.3, 11.4

 Supp Problems: 11.9, 11.13, 11.16

12 Initial Value Problems READ: **DE** Chap 12, p104.

 Solved Problems: 12.1, 12.3, p 104-105.

 Supp Problems: 12.7-12.13 (odd) p 107

13 Applications of Second Order READ: **DE** Chap 13, p 108-111

 Linear DEs Solved Problems: 13.1 – 13.12

 Supp Problems: 13.26 – 13.51 (every third

 problem)

14 Applications of Second Order READ: **DE** Chap 13, p 108-111

 Linear DEs Solved Problems: 13.1 – 13.12

 Supp Problems: 13.26 – 13.51 (every third

 problem)

15 Review Session REVIEW: Lessons 1-14

16 **QUIZ I** REVIEW: Lessons 1-14

17 **Complex Numbers**: Introduction READ: **FA** p 1-3

##  PROBS: p 3, 1-13

18 **Complex Numbers**: Geometry of READ: **FA** p 4-7

#  Complex Numbers PROBS: p 7, 1-13

19 **Complex Numbers**: Trigonometric READ: **FA** p 8-10

#####  Form of Complex Numbers PROBS: p 11, 1-25

20 **Complex Numbers**: Euler’s READ: **FA** p 12-14

 Formula PROBS: p 14, 1-18

21 **Series/Sequences**: Demo READ: Waveform Handout

 PROBS: Handout

22 **QUIZ II** REVIEW Lsns 17-21

### 23 Fourier Series: Periodic Waveforms READ: AFA p 1-3

 Solved Probs: p 11-12, 1-3

 PROBS: p 19, 18

### 24 Fourier Series: Evaluation of Fourier READ: AFA p 5-8

 Coefficients Solved Probs: p 14, 8

 PROBS: p 19-20, 20-22

### 25 Fourier Series: Evaluation of Fourier READ: AFA p 9-10

###  Coefficients Solved Probs: p 17, 11

 PROBS: p 21, 26

26 **Fourier Series:** Waveform READ: **AFA** p 22, 25-26

 Symmetry (even and odd functions)

### 27 Fourier Series: The Complex Form READ: AFA p 40-41

of Fourier Series Solved Probs: p. 47, 1

 PROBS: p 52, 12

### 28 Fourier Series: The Complex Form READ: AFA p 40-41

of Fourier Series Solved Probs: p. 47, 1

 PROBS: p 52, 12

### 29 Fourier Series: Complex Frequency READ: AFA p 43-45

Spectra Solved Probs: p 49-50, 5

 PROBS: p 52, 15

### 30 Fourier Transforms: Unit Impulse READ: AFA p 54-57

Function and Unit Step Function Solved Probs: p 66-68, 1,3,4

### 31 Fourier Transforms: READ: AFA p 75-76

###  Solved Probs: p 85-86, 1-3

### 32 Fourier Transforms: READ: AFA p 75-76

###  Solved Probs: p 85-86, 1-3

### 33 Fourier Transforms: Properties of READ: AFA p 76-81

###  Fourier Transforms Solved Probs: p 87-88, 4-7

### 34 Fourier Transforms: Properties of READ: AFA p 76-81

 **Fourier Transforms Solved Probs: p 87-88, 4-7**

## 35 Review Session REVIEW: Lsns 23-31

36 **QUIZ III** REVIEW: Lsns 23-31

(9/22/03)