PALOMAR COLLEGE
COURSE OUTLINE OF RECORD FOR
DEGREE CREDIT COURSE

X Transfer Course X A.A. Degree applicable course
(check all that apply)

COURSE NUMBER AND TITLE: CSIS 221 Data Structures

UNIT VALUE: 4

MINIMUM NUMBER OF SEMESTER HOURS: 80

BASIC SKILLS REQUIREMENTS: Appropriate language and computational skills

ENTRANCE REQUIREMENTS

PREREQUISITE: CSIS 220

COREQUISITE: None

RECOMMENDED PREPARATION: None

SCOPE OF COURSE:
Introduction to the definition, implementation, and applications of the basic data structures and associated operators that are found in computer science. These include arrays, stacks, recursion, queues, lists, tables, references, trees, and graphs. Focus on object-oriented programming design concepts using Java. Includes hands-on laboratory experience reinforcing the lecture material.

SPECIFIC COURSE OBJECTIVES: Successful students will be able to:
1. Use correct program design with object-oriented principles.
2. Separate implementation details from interface protocols in program design.
3. Use appropriate user-defined data structures such as stacks, queues, linear and non-linear linked lists and binary trees.
4. Design appropriate sorting and searching algorithms.
5. Utilize design principles of hierarchy, modularity, and data abstraction.

CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:

I. Introduction, course requirements, policies, and method of evaluation.

II. Introduction to Data Structures
- A. Algorithms
- B. Access and organization of data
- C. Space vs time considerations
- D. Review of object-oriented concepts

III. Overview of a high-level language
- A. Review details of editor, compiler, debugging aids
- B. Problem solving techniques of top-down design and stepwise refinement
- C. Control structures, functions, passing of parameters

IV. Arrays
- A. Storage requirements and implementation
- B. One and two dimensional arrays
- C. Row major and column major order

V. Stacks
- A. Primitive operation
- B. Nesting and scopes
- C. Stack representation
- D. Infix, prefix, and postfix notation

VI. Recursion
- A. Recursive definition and processes
- B. Factorials, fibonacci, tower of hanoi
- C. Implementation

VII. Queues
- A. Primitive operations
- B. Real world simulations
- C. Linear representation
- D. Circular representation
- E. Pascal implementation

VIII. Linked Lists
- A. Linear lists
- B. Circular lists
- C. Doubly Linked lists
- D. Array representation of lists
- E. Sparse matrix representation

IX. References

X. Binary Trees
- A. Definitions and terminology
- B. Applications
- C. Traversals (inorder, preorder, postorder)

XI. Sorting
- A. Primitive vs sophisticated
- B. Space-time complexity: best, worst cases
- C. $O(n^2)$ sorting algorithms
- D. O(n log n) sorting algorithms
- E. Insertion sorts
  1. Linear insertion
  2. Binary insertion
  3. Shellsort
- F. Exchange sorts
  1. Bubblesort
  2. Shakersort
  3. Quicksort
- G. Selection Sorts
  1. Straight selection
  2. Tree selection
  3. Heapsort

XII. Searching
- A. Sequential search
- B. Binary search
- C. Binary tree search
- D. Hashing, collision resolution policies
- E. Time complexity: best, worst cases

REQUIRED READING:
Carrano, Frank. Data Abstraction and Problem Solving with Java. Boston: Addison Wesley, 2003.

SUGGESTED READING:

None

REQUIRED WRITING:
Problem solving exercises are assigned, requiring students to complete five or six computer programming labs. Each programming lab will consist of a hands-on exercise applying theory principles learned in class. Programs must be well documented (at least one paragraph) in terms of their overall design goals. Additionally, each subprogram must be documented (two or three sentences) as to its purpose and overall performance.

OUTSIDE ASSIGNMENTS:

Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.
There are written homework exercises within each section of each chapter which are assigned, requiring an average of one hour to complete. In addition, numerous programming assignments are assigned, each ranging from one to ten hours to complete by an average student.

INSTRUCTIONAL METHODOLOGY:

Check all that apply:
_X_ lecture
_____ laboratory
_X_ lecture-laboratory combination
_____ directed study

DISTANCE LEARNING:

This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.
Yes X_____ No____

If yes, check all that apply:

_____ Television Course (Video one-way, e.g. ITV, video cassette, etc.)
_X_ Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
_____ Two-Way Video Conferencing (Two-way interactive video and audio)
_____ One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
_____ Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

GRADING POLICY AND STANDARDS (include methods of determining whether the stated objectives have been met by students):

Programming Assignments	45%
Midterm	25%
Final	30%

IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?
Yes _X_ No ____ Number of times course may be taken for credit: _3_

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

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SIGNATURES ON FILE