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| **VISION**  **A premiere Higher Institution in Agri-Fisheries and Socio-cultural Development in the ASEAN Region** | **CORE VALUES**  The College commits to pursue our vision, accomplish our mission and achieve our goals through our core values of excellence, integrity, innovation, stewardship, love of God and country |
| **MISSION**  **DNSC strives to produce competent human resource, generate and utilize knowledge and technology, uphold good governance and quality management system for sustainable resources and resilient communities.** | **OUR GRADUATES**  Our graduates carry DNSC’s values into their workplaces as competent, collaborative workers and socially-connected ethical leaders. They adhere to professional ethics and seek solutions to workplace problems. They are creative, critical thinkers, and resilient to cross-cultural environment. |
| **PROGRAM EDUCATIONAL OBJECTIVES**  Within five years after graduation, the Alumni of the Bachelor of Science in Information Technology program of the Davao del Norte State College shall:  PEO1. Display advanced competence and proficiency in planning, designing, developing, implementing, operating, evaluating, customizing and administrating computer systems and infrastructure that meets the industry and organization requirements.  PEO2. Ability to hold leadership roles, including positions that are supervisory or managerial in nature to apply attained best practices in the field of Information Technology.  PEO3. Demonstrate ethical behavior as an IT professional and sensitivity to the impact of technology on society.  PEO4. Engage in life-long learning and continuing professional development such as advanced graduate studies, training and certifications. | **PROGRAM OUTCOMES**  The Bachelor of Science in Information Technology graduates will have the ability to:  PO1: Apply knowledge of computing, science, and mathematics appropriate to the discipline.  PO2: Understand best practices and standards and their applications.  PO3: Analyze complex problems and identify and define the computing requirements appropriate to its solutions.  PO4: Identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems.  PO5: Design, implement, and evaluate computer-based systems, processes, components, or programs to meet desired needs and requirements under various constraints.  PO6: Integrate IT-based solutions into the user environment effectively.  PO7: Apply knowledge using current techniques, skills, tools, and practices necessary to the IT profession.  PO8: Function effectively as a member or leader of a development team recognizing the different roles within a team to accomplish a common goal.  PO9: Assist in the creation of an effective IT project plan.  PO10: Communicate effectively with the computing community and with society at large about complex computing activities through logical writing, presentations, and clear instructions.  PO11: Analyze the local and global impact of computing information technology on individuals, organizations, and society.  PO12: Understand professional, ethical, legal, security and social issues and responsibilities in the utilization of information technology.  PO13: Recognize the need for and engage in planning self-learning and improving performance as a foundation for continuing professional development. |

**I. Course Name** : IT221 – Data Structures and Algorithms

**II. Course Description** : This course is one of the fundamental papers towards a more comprehensive understanding of programming and application development. It covers standards data representation and algorithms to solve computing problems efficiently (for space requirement and algorithm time complexity). The student is expected to work towards a sound theoretical understanding of Data Structures and compliment the same with hands-on implementing experience. Solving computational problems that involve manipulating collections of data, study a core set off data abstractions, data structures, and algorithms, that provide a foundation for writing efficient programs.

**III. Course Credit** : 3 units

**IV. Course Hours per week** : 3 hours lecture

**V. Pre-requisite** : IT Elective 3

**VI. Course Outcomes** :   
Legend: I – Introductory, E – Enabling, D – Demonstrative

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| **COURSE LEARNING OUTCOMES (CLO) AND LINKS TO PROGRAM OUTCOMES (PO)** | | | | | | |  |
| Upon completion of this course, the students are expected to: | **PO** | | | | | **Assessment Tools** | **Schedule** |
| **01** | **03** | **05** | **07** | **10** |  |  |
| CLO1: Understand the need and working of advanced search and sorting technique | E | E | D | E | E | Midterm Assessment | Week 1-9 |
| CLO2: Calculate and measure the efficiency of code and work through insert and delete for different data structures. | E | E | D |  | E | Midterm Assessment | Week 1-9 |
| CLO3: Appreciate some interesting algorithms like QuickSort, AVL and Shortest Path etc. | E | E | D |  | E | Final Assessment / Final Project | Week 10-17 |

**VII. Course Outline**

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| **Course Content/Subject Matter** | **Timetable**  **(in week)** |
| **Class Orientation**  Rules and Regulation  VM, Core Values  Course Overview  Classroom Policies  Distribution of Course Outline | Week 1 |
| **Module 1: Introduction and Overview of Data Structures**  Lesson 1: Introduction of Data Structures and Examples  Lesson 2: Algorithm Analysis | Week 2-3 |
| **Module 2: Abstract Data Types**  Lesson 1: Stack  Lesson 2: Queues  Lesson 3: Linked Lists | Week 4-6 |
| **Module 3: Hashing and Sorting**  Lesson 1: Hashing  Lesson 2: Sorting | Week 7-8 |
| **Midterm Examination/Assessment** | Week 9 |
| **Module 4: Tress**  Lesson 1: Introduction of Trees  Lesson 2: Binary Search Trees  Lesson 3: Heapsort  Lesson 4: AVL Search Trees | Week 10-14 |
| **Module 5: Graph**  Lesson 1: Graph  Lesson 2: Networks | Week 15-17 |
| **Final Examination/Assessment** | Week 18 |

**VIII. Summative Assessments:**

1. Midterm Assessment (Exam): Written Examination  
2. Final Assessment (Exam): Written Examination

**IX. Course Requirements**

**Summative Assessments 60%  
Performance Task/Written Outputs 40%   
Total 100%**

**X. Grading System:**

1. Passing Score : 50% of the highest possible score.

2. Transmutation :

3. Criteria for Grading : Midterm Requirements - 50%

Final term Requirements - 50%

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| **Numerical Equivalent** | **Percentage Equivalent** | **Description** |
| 1.00 | 98-100 | Excellent |
| 1.25 | 95-97 | Outstanding |
| 1.50 | 92-94 | Very Good |
| 1.75 | 89-91 | Good |
| 2.00 | 86-88 | Very Satisfactory |
| 2.25 | 83-85 | Satisfactory |
| 2.50 | 80-82 | Moderately Fair |
| 2.75 | 77-79 | Fair |
| 3.00 | 75-76 | Passing |
| 4.00 | 72-74 | Conditional (must be removed through a removal exam (prior to submission of final grades). If a student passes, the final grade shall not be better than 3.0. If he fails, the final grade shall be 5.0. |
| 5.00 | 71-below | Failure. It requires a re-enrollment of the course. |
| INC | Incomplete | This is given if a student whose class standing throughout the semester or term is passing but he/she fails to take the final examination, or student fails to complete all the academic requirements for the course due to illness or other valid reasons. The deficiency will be indicated by “INC” which must be removed within a period of one year by passing the examination or meeting all the requirements for the course except for graduating students in a given semester. After which the student shall be given a final grade based on his overall performance. Accomplished completion form signed by the subject Instructor must be submitted within the specified period for such removal. If the student fails to do so, he shall automatically get a grade of 5. |

**Machine Problem Rubrics**

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| **CRITERIA** | **NEEDS IMPROVEMENT** | **DEVELOPING** | **SUFFICIENT** | **ABOVE AVERAGE** |
| Accuracy | **20**  The student’s solution demonstrates poor accuracy based on the test data with logical, and syntax errors. | **25**  The student’s solution demonstrates poor accuracy based on the test data with logical error. | **40**  The student’s solution demonstrates average accuracy based on the test data. | **50**  The student’s solution produced accurate output based on the test data. |
| Readability | **5**  The student’s source code does not run efficiently. | **10**  The student’s source code runs efficiently but fails to follow naming convention errors. | **15**  The student’s source code runs efficiently with minimal proper naming convention errors. | **20**  The student’s source code runs efficiently and follows proper naming convention. |

**XI. References:**

**Essential Text Book**

[1] Malik, DS. (2013). Data structures using java. Thomson/Course Technology  
[2] Delfinado, C. (2016), Data structures and algorithms. C & E Bookshop  
[3] Malik, DS. (2012). Data structures using java. Thomson/Course Technology  
[4] 3G Elearning (2015). Java programming. 3G Elearning publishing  
[5] Goodrich, M. Tamasia, R. (2010). Data structures and algorithms in java 5th edition. John Wiler and Sons Inc. Publishing  
[6] Gilberg, F Richard & Forouzan, A Behrouz. Data Structures: A Pseudocode Approach with C. 2nd Edition. Cengage 2008.

**XI. Suggested Readings:**

[1] Farell, J. (2013). An object-oriented approach to programming logic and design. Cengage Learning  
[2] Malik, DS. (2012). Java programming from problem analysis to program design. Cengage Learning  
[3] Savich, W. (2011). Java: an introduction to problem-solving. Pearson  
[4] Farrel, J. (2013). Programming logic and design. Cengage Learning  
[5] Markham, Noel (2014). Java programming interviews exposed. Pearson  
[6] Horowitz Sahni Anderson-Freed, Fundamental of Data Structures in C, Universities Press, Reprint 2008.  
[7] Richard Johnsonbaugh, Algorithims, Pearson Education, 2nd Edition, 2008.  
[8] Robert Sedgwick, Algorithim in C++, Addison-Wesley Publishing Company.  
[9] Knuth, Donald E, Art of Computer Programming, Sorting & Searching, Addison-Wesley, 3rd Edition, 2005  
[10] DNSC Student Handbook

Prepared and submitted by:

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