Cape Peninsula University of Technology

# Faculty of Engineering and the Built Environment
# Department of Electrical, Electronic and Computer Engineering

## Software Design 1 (SDN150S)
## Practical 4

You have the responsibility, if you are a senior software developer at Google, to educate new interns on the fundamentals of C programming, which are utilized in the process of product development. During the training exercise, you will be discussing the following programming concepts such as arrays, pointers, structures, and unions with the interns, and answering the following questions:

1. Write a program to store the entries of five students who sit for MATH, PHYSICS, and CHEMISTRY exams. Using a 2D array, find the MAX, MIN, and MEAN performance of students who took the exams. Finally, print the student's name whose mean score is less than 60%.
2. Define a union called "Color" that contains three members: red, green, and blue, each of type unsigned char. Write a program to assign values to the union members and print the RGB color values. Define a structure called "Student" with members "name" (string), "rollNumber" (integer), and "marks" (float). Write a program to create an array of five "Student" structures and initialize their members.
3. Define a structure called "Student" with members for full name, student number, subject title, and marks in three subjects. Write a program to create an array of five students based on user input, assign values to struct members, and print the details of any given student.
4. Write a program that initializes an array of five float values representing the resistance of five circuits. Then, use a pointer to iterate through the array and find the average resistance value. Display the average.
5. Define a structure called "Book" with members for title, author, and price. Write a program to create an array of three books, assign values to their members, and print the details of the books.
6. Create a structure named 'CircuitComponents' that contains the resistance (in ohms), inductance (in henry), and capacitance (in farads) of an RLC circuit. Write a program that prompts the user to input the values of these components and calculates the total impedance of the circuit using the formula **Z = sqrt((R2) + (X2)),** where X is the reactance given by **X = 2fL - 1/(2fC), and** f is the frequency (60 Hz). Finally, display the impedance.
7. Create a union called "DataValue" with members "integer" (int) and "floatingPoint" (float). Write a program to read user input and determine whether it represents an integer or a floating-point number using the union.
8. Develop a welcome to CPUT Sports Hub form using the C program. request a user to enter login details and check that the username entered contains "@mycput.ac.za", and the password entered has at least a string of eight characters, which must include a special character. Using pointers, ensure you create a separate function to check for the username and password login requirements.