Template of Course Specification

Faculty: CIT
Department: CS
Program: B.Sc(Software Engineering)

I. General information about the course :						
1.	**Course Title:**	Component based Software Engineering				
2.	**Course Code and Number :**	SEL02				
3.	**Credit Hours: 3**	**Lecture**	**Seminar/Tutorial**	**Practical**	**Training**	**Total**
		2	**2**	**0**		**3**
4.	**Study Level and Semester:**	Level 4 / Semester 7 or 8				
5.	**Pre-requisites (if any):**	Software engineering (CS325)				
6.	**Co-requisites (if any) :**	Differential equations(CS221) and Data structures and algorithms (CIT07),Calculus (CIT02)				
7.	**Program in which the course is offered**	B.Sc(Software engineering)				
8.	**Teaching Language:**	English				
9.	**Study System :**	Semester Based				
0.	**Prepared by :**	Course Facilitator (Bridget Shakesy)				
1.	**Approval date :**					
2.	**Approved by:**	Department				

II. Course Description:

Instead of building monolithic systems from scratch, Component-based Software Development (CBD) aims to construct systems by assembling ready-made components, and thereby reduce production cost and time-to-market, whilst increasing software reuse. The cornerstone of a CBD approach is the underlying component model, which defines what components are and how they can be composed. Current component models do not yet achieve the aforementioned objectives of CBD.To present an in-depth study of the use of software components in software architecture, design, implementation and testing. To discuss the issues involved in component re-use, including selection, adaptation and integration. To implement software quality models in software development

III. Course Aims

This Course aims to:

- To present an in-depth study of the use of software components in software architecture, design, implementation and testing.
- To present the use of UML component diagrams for modelling runtime structure of a component based software system; and class and package diagrams to present the logical architecture of a component based system.
- To present a comprehensive suite of architectural styles and technique, including multi-layered architecture, model-view-control, pipe and filter, service oriented architecture, message oriented architecture, event driven architecture, plugin architecture and system buses.
- To discuss the selection of architectural styles based on design constraints and considerations for different aspects of a system and their overall integration.
- To discuss the issues involved in component re-use, including selection, adaptation and integration.
- To discuss the use of component oriented frameworks and standards such as COM/DCOM and CORBA to implement component based systems.
- To discuss the design considerations for and implementation of component oriented frameworks by applying BPEL (Business process execution language –XML based) designer , Apache ODE, X-MAN tool (model driven engineering), IDL (interface description language)
- To learn about implementation aspect using

ArchJava(connecting architecture to implementation) , EJB, ActiveX

VI. Course Intended Learning Outcomes (CILOs) :

Knowledge and Understanding:

Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)

Knowledge and Understanding PILOs	Knowledge and Understanding CILOs
After completing this program, students would be able to:	After completing this course, students would be able to:
A1. Understand the principles and theories of mathematics, programming, algorithms and its complexities.	a2.provide an in-depth exposition of key representative Component Based Development approaches
A2. Distinguish between selected canonical forms of operating systems and computer hardware, architecture and organization.	a1 .enumerate the advantages and limitations of adopting a component oriented approach to software engineering
A3. Understand the use and impact of Information and Communication Technology (ICT) by recognizing the concepts of enterprise information management and networking.	----
A4. Understand the software process life cycles, for small, medium and large software projects,	a1.enumerate the advantages and limitations of

and different approaches of software development, software project management, risk and quality management, and human-computer interaction.	adopting a component oriented approach to software engineering a3.describe a range of software architectural styles, including their implementation
A5. Recognize the social, professional, legal, ethical, and cultural issues involved in the use of computer technology.	----

Intellectual Skills :	
Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)	
Intellectual Skills PILOs	**Intellectual Skills CILOs**
After completing this program, students would be able to:	**After completing this course, students would be able to:**
B1. Determine and analyze criteria, specifications and requirements appropriate to specific computing problems and formulate strategies to solve them.	b2. Evaluate and choose between a number of re-usable components for integration into a software system. b3.Design and implement software architecture in a component oriented framework and to estimate the cost for the development model
B2. Differentiate the various methods of computational thinking, determining their wide relevance and applicability within other domains in everyday life, and being able to employ them in different conditions.	b1.Document software architecture from different viewpoints as appropriate, using UML component, package and class diagrams
B3. Choose the most appropriate methods and tools including deploying appropriate theory, practices, and tools for the specification, design, implementation, and maintenance as well as the evaluation of computer-based systems.	b2. Evaluate and choose between a numbers of re-usable components for integration into a software system. b3.Design and implement software architecture in a component oriented framework and to estimate the cost for the development model
B4. Criticize systems in terms of general quality	b2. Evaluate and choose between a number of re-

attributes and possible tradeoffs presented within the given problem.	usable components for integration into a software system.

Professional and Practical Skills	
Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)	
Professional and Practical Skills PILOs	**Professional and Practical Skills CILOs**
After completing this program, students would be able to:	**After completing this course, students would be able to:**
C1. Apply fundamental concepts of computer science, software engineering, human-computer interaction, science and mathematics in the modeling and design of computer systems.	c1. apply the techniques in software architectural units, component model based on objects; c2. adapt the techniques in component model on encapsulated components
C2. Develop a wide range of software through all stages of their life cycle, namely problem analysis, requirements specification, design, construction; verification and evolution using appropriate methods and tools.	c1. apply the techniques in software architectural units, component model based on objects; c2. adapt the techniques in component model on encapsulated components
C3. Operate computing equipment and software systems effectively and efficiently.	---
C4. Evaluate software process and artifacts in terms of software quality and models.	c3.Assess and implement software components quality and to establish the testing and maintenance process of component based models
C5. Plan, undertake, and monitor software projects.	c3.Assess and implement software components quality and to establish the testing and maintenance process of component based models

Transferable (General) Skills :	
Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)	
Transferable (General) Skills PILOs	Transferable (General) Skills CILOs
After completing this program, students would be able to:	After completing this course, students would be able to:
D1. Communication skills: Make succinct presentations to a range of audiences about technical problems and their solutions. This may involve face-to-face, written communication or	d2.communicate effectively well-informed and well-reasoned positions on these issues, verbally (oral analysis) and in writing (project

electronic communication.	report) by applying critical thinking reasoning skills, technical skills on a goals of the CBD paradigm
D2. Teamwork: Be able to work effectively as a member of a development team.	d2.communicate effectively well-informed and well-reasoned positions on these issues, verbally (oral analysis) and in writing (project report) by applying critical thinking reasoning skills, technical skills on a goals of the CBD paradigm
D3. Numeracy skills: Understand and explain the quantitative dimensions of a problem.	d1.Develop and present a project outcome that demonstrates understanding of, and engagement with, the key representative CBD
D4. Self-management skills: Manage one's own learning and development, including time management and organizational skills.	d1.Develop and present a project outcome that demonstrates understanding of, and engagement with, the key representative CBD
D5. Professional development skills: Keep abreast of current developments in the discipline to continue one's own professional development.	d1.Develop and present a project outcome that demonstrates understanding of, and engagement with, the key representative CBD

VI. Alignment of CILOs to Teaching and Assessment Strategies

First: Alignment of Knowledge and Understanding CILOs

Knowledge and Understanding CILOs	Teaching Strategies	Assessment Strategies
a1.Enumerate the advantages and limitations of adopting a component oriented approach to software engineering	Direct teaching (lectures, tutorials, problem solving, groups discussions) Interactive learning (, forums, cooperative learning) Research project Assignments Experimental learning	Observation, Assignments , quizzes , problem sheets and exams , exams presentation, tech reports, reports Sheets, problem formulation, Case study , Presentation,
a2. Provide an in-depth exposition of key representative Component Based Development approaches		
a3. describe a range of software architectural styles, including their implementation		

	Presentation E-learning, M-learning Self learning Indirect learning (web resources)	Viva, Projects, Seminars, Report,

Second: Alignment of Intellectual Skills CILOs		
Intellectual Skills CILOs	**Teaching Strategies**	**Assessment Strategies**
b1. Document software architecture from different viewpoints as appropriate, using UML component, package and class diagrams	Direct teaching (lectures, tutorials, problem solving) Interactive learning (, forums, cooperative learning) Assignments Experimental learning Presentation E-learning, M-learning Self learning Indirect learning (web resources)	Written test ,Quizzes, Report Assignments ,problem sheets and exams, tech reports, problem formulation
b2. Evaluate and choose between a number of re-usable components for integration into a software system		
b3. Design and implement software architecture in a component oriented framework and to estimate the cost for the development model		

Third: Alignment of Professional and Practical Skills CILOs

Professional and Practical Skills CILOs	Teaching Strategies	Assessment Strategies
c1. Apply the techniques in software architectural units, component model based on objects	Group Projects Tutorials Assignments	Report Worksheets Report + Presentation Observations
c2.Adapt the techniques in component model on encapsulated components		

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c3 . Assess and implement software components quality and to establish the testing maintenance process of component based models		

Fourth: Alignment of Transferable (General) Skills CILOs		
Transferable (General) Skills CILOs	**Teaching Strategies**	**Assessment Strategies**
d1. Develop and present a project outcome that demonstrates understanding of, and engagement with, the key representative CBD	Grouping Tips Notes software projects	Presentation Observation Report
d2. Communicate effectively well-informed and well-reasoned positions on these issues, verbally (oral analysis) and in writing (project report) by applying critical thinking reasoning skills, technical skills on a goals of the CBD paradigm.		

VII. Course topics and sub-topics (theoretical and practical) with contact hours and alignment to CILOs

Topics/Units of Course Contents					
First: Theoretical Aspects					
No.	**Course Topics/Units**	**Sub-topics**	**No. of Weeks**	**Contact Hours**	**CILOs**
1	Basic Concepts and models	○ Components ○ Composition ○ Component models	1	3	a1,a2
2	Specifications of Software Components	The CBD process ○ Component life cycle ○ System life cycle	1	3	a2,a3
3	Software Architecture and Components	○ Categories based on components ○ Categories based on composition mechanisms	1	3	a2,a3
4	Component models based on objects	○ Objects as components ○ Method call as a composition mechanism ○ Enterprise JavaBeans, JavaBeans	2	6	a3,b2,c1,d1,d2
5	Component models based on architectural units	○ Architectural units as components ○ Port connection as a composition mechanism ○ Acme/ArchJava, UML2.0	1	3	a3,b1,c1,d1,d2
6	Component models based on encapsulated components	○ Encapsulated components ○ Coordination as a composition mechanism ○ Web services, X-MAN	1	3	a3,b1,c2,d1,d2

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7	MIDTERM				
8	Software Reuse and Components Classification		1		a3,b2,b3
9	Software Component Quality Models		1	3	c3
10	Component Composition and Integration		1	3	b2,b3
11	Testing Component-Based Systems		1	3	c3
12	Evolution and Maintenance of Component-Based Systems		1	3	c3
13	COTS Based Development and Its Cost Estimation		1	3	b3
14	Revision				
15	**FINAL EXAM**				
Total number of weeks and hours			**14**	42	

I. Tasks and Assignments :				
No.	**Task/Assignment**	**CILOs**	**Week due**	**Mark**
1	Assignment 1	a2,a3,b1	4	10
2	Assignment 2	a3,b2,b3,c3	11	10
3	Project	a3,b1,c1,c2	12	20

I. Learning Assessment:					
No.	**Assessment Tasks**	**Week due**	**Mark**	**Proportion of Final Assessment**	**Aligned CILOs**
1	Quizzes	3 , 6, 10	10+10+10	10%	--
2	Problem based Assignments	4 & 11	10+10	10%	

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3	Midterm exam	7	25	10%	--
4	Project (in phases)	8,12	10+10	20%	
5	Final exam	15	100	50%	--
Total			100		

I. Learning Resources :
(Author, (Year), Book Title, Edition, Publisher, Country of publishing)
Textbooks-not more than 2
• I. Crnkovic and M. Larsoon, Building Reliable Component-Based Software Systems, Artech House, latest edition • G.T. Heineman and W.T. Councill, Component-Based Software Engineering: Putting the Pieces Together, Addison-Wesley, latest edition
Essential References-not less than 4
• C. Szyperski, Component Software - Beyond Object-Oriented Programming, Addison-Wesley, latest edition • J. Gao, H-S J. Tsao, and Y. Wu, Testing and Quality Assurance for H. Mili, A. Mili, S. Yacoub, and E. Addy, Reuse-Based Software Engineering, John Wiley & Sons, latest edition • Component-Based Software, Artech House, latest edition
Electronic Materials and Web Sites
• Selection of papers from technical literature

Tutorials:

Week.2 -4

Unified modeling language (UML 2.0) :

- UML 2 Component Diagrams
- Documenting Component and Connector Views with UML 2.0
- IBM - Component Diagrams.

Week.5-7

Overview of the CORBA Component Model.

CORBA (Common Object Request Broker Architecture) ,COM (component object model) /

Transactional COM+: Designing Scalable Applications.

Week.8-11

Acme(general architectural description language) /ArchJava(connecting architecture to implementation) , The Enterprise JavaBeans Component Model(EJB), ActiveX

Week.no.12

BPEL (Business process execution language –XML based) designer , Apache ODE, X-MAN tool (model driven engineering), IDL (interface description language

Week.no.13

Bonobo and Free Software Gnome Components..

Choosing Between COM+, EJB, and CCM..

Software Agents as Next Generation Software Components.

7.	Course Policies (To be determined by Faculty Deanship):
Based on university regulations, the following aspects should be figured out:	
1.	**(**Class Attendance**) :**
2.	**(**Tardy**) :**
3.	**(**Exam Attendance/Punctuality**) :**
4.	**(**Assignments & Projects**) :**
5.	**(**Cheating**) :**
6.	**(**Plagiarism**) :**
7.	**(**Other policies**) :**

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Template of Course Syllabus

Faculty : Computing and Information technology

Department : Computer Science

Program : B.Sc(software engineering)

I. General information about the course instructor :							
Name		**Office Hours(3 Hours Weekly)**					
Location & phone number		**Sat**	**Sun**	**Mon**	**Tue**	**Wed**	**Thu**
Email							

No.	Course Topics/Units	Sub-topics	No. of Weeks	Contact Hours
1	Basic Concepts and models	○ Components ○ Composition ○ Component models	1	3
2	Specifications of Software Components	The CBD process ○ Component life cycle ○ System life cycle	1	3
3	Software Architecture and Components	○ Categories based on components ○ Categories based on composition mechanisms	1	3
4	Component models based on objects	○ Objects as components ○ Method call as a composition mechanism ○ Enterprise JavaBeans, JavaBeans	2	6
5	Component models based on architectural units	○ Architectural units as components ○ Port connection as a composition mechanism ○ Acme/ArchJava, UML2.0	1	3

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6	Component models based on encapsulated components	○ Encapsulated components ○ Coordination as a composition mechanism ○ Web services, X-MAN	1	3
7				
8	Software Reuse and Components Classification		1	
9	Software Component Quality Models		1	3
10	Component Composition and Integration		1	3
11	Testing Component-Based Systems		1	3
12	Evolution and Maintenance of Component-Based Systems		1	3
13	COTS Based Development and Its Cost Estimation		1	3
14				
15				
Total number of weeks and hours			**14**	

I. Tasks and Assignments :

No.	Task/Assignment	CILOs	Week due	Mark
1	Assignment 1	a2,a3,b1	4	10
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I. Learning Assessment:

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3	Midterm exam	7	25	10%	--
4	Project (in phases)	8,12	10+10	20%	
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Total			100		

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- Component-Based Software, Artech House, latest edition

Electronic Materials and Web Sites

- Selection of papers from technical literature

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Tutorials:

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13.	**(**Plagiarism**) :**
14.	**(**Other policies**) :**

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