



# Bharath

**INSTITUTE OF HIGHER EDUCATION AND RESEARCH**

(Declared as Deemed-to-be University under section 3 of UGC Act 1956)

## CIRCULAR

09.06.2017

The School of computing, Bharath Institute of Higher Education and Research is planned to conduct a certification value added course on **Certificate Course of Accelerating C, C++, Open CI & RTL Application** for the benefit of students. This course is scheduled from 12.06.2017 to 24-06-2017 which includes theory and practical. The timings are 9:30 AM to 12:30 PM (FN) and 1:30 PM to 4:30 PM(AN) and Saturday (FN&AN).

All Registered Students must attend all the classes without fail. The following faculty members are assigned to handle the course. S.NO	Name of the Faculty	Designation
1	Dr.C.Rajabhusanam	Professor
2	Ms.C.Geetha	Assistant Professor

**Head of Department**

To

Copy to CSE

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**HEAD OF DEPARTMENT**  
Department of Computer Science & Engg.,  
**Bharath Institute of Higher Education & Research**  
(Declared as Deemed to be University U/S 3 of UGC Act, 1956)  
Chennai-600 073. INDIA



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## **CERTIFICATE COURSE ON ACCELERATING C, C++, OPEN CL & RTL APPLICATION**

**Date of Introduction of the Course: 24.07.2017**

### **COURSE SYLLABUS**

#### **1. Introduction of OpenCL Framework**

Explains how application developers can Open Computing Language (OpenCL) framework

#### **2. OpenCL Framework Fundamentals -1**

Describes OpenCL framework models such as the Platform model, Execution model, Memory model, and Programming model.

#### **3. OpenCL Framework Fundamentals -2**

Describes OpenCL framework components such as the OpenCL platform API, OpenCL run-time API, and OpenCL programming language.

#### **4. Synchronization**

Describes OpenCL synchronization techniques such as events, barriers, blocking write/read, and the benefit of using out-of-order execution.

#### **5. Introduction to ND Ranges**

Explains the basics of ND Range (N dimensional range) and the OpenCL execution model that defines how kernels execute with the ND Range definition. Functions

#### **6. Working with ND Ranges**

Explains the host code and kernel code changes with respect to ND Range. Also explains how ND Range works and the best way to represent the work-group size for the FPGA architecture.

#### **7. Profiling**

Describes the different reports generated by the tool that help to optimize data transfer and kernel optimization.

#### **8. Debugging**

Explains the support for debugging host code and kernel code as well as tips to debug the system.

#### **9. Optimization Methodologies**

Describes the recommended flow for optimizing an application in the environment.

#### **10. Memory Transfer Optimization Techniques**

Describes the various optimization techniques for data transfer between kernels and global memory.

#### **11. Kernel Optimization Techniques**

Apply different techniques such as loop unrolling, pipelining, and DATAFLOW.

## 12. Using the RTL Kernel Wizard to Reuse Existing IP as Accelerators

Describes how the environment provides RTL kernel developers with a framework to integrate their hardware functions into an application running on a host PC connected to an FPGA via a PCIe interface.

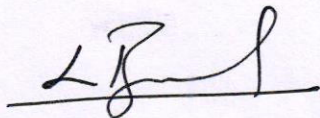
### COURSE OBJECTIVES

This course helps to develop, debug, and profile new or existing OpenCL™, C/C++, and RTL applications development environment for use on Xilinx FPGAs. Also learn how to run designs on the Alveo™ accelerator card using Nimble Cloud. The focus is on learning how to utilize techniques in the RTL environment to Reduce latency Utilize the massive parallelism inherent to FPGAs Optimize throughput Pipeline for performance This course also provides an introduction to targeting the Alveo accelerator card.

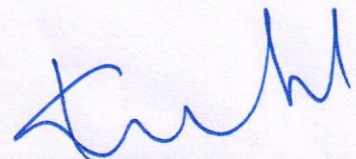
**Specifically, the course has the following objectives:**

#### **Students will learn**

1. Describe how the FPGA architecture lends itself to parallel computing
2. Explain how the SDx development environment helps software developers to focus on applications
3. Examine the OpenCL API execution model
4. Analyze the OpenCL API memory model
5. Create kernels from C, C++, OpenCL, or RTL IP (using the RTL Kernel Wizard)
6. Apply host code optimization and kernel optimization techniques
7. Move data efficiently between kernel and global memory
8. Profile and debug OpenCL API code using development environment



**COURSE COORDINATOR**



**HEAD OF THE DEPARTMENT**

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# Sharath

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## **CERTIFICATE COURSE ON ACCELERATING C, C++, OPEN CL & RTL APPLICATION**

**Date of Introduction of the Course: 24.07.2017**

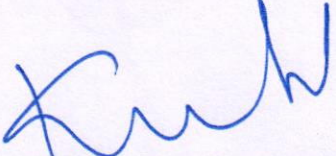
The timings are 9:30 AM to 12:30 PM (FN) and 1:30 PM to 4:30 PM(AN)  
Saturday (FN&AN).

### **Time Table & Lesson plan**

<b>CLASS</b>	<b>DATE</b>	<b>TOPIC</b>
1,	12-06-2017(FN)	<b>1. Introduction of OpenCL Framework</b> Explains how application developers can Open Computing Language (OpenCL) framework
2	13-06-2017(FN)	<b>2. OpenCL Framework Fundamentals -1</b> Describes OpenCL framework models such as the Platform model, Execution model, Memory model, and Programming model.
3,4	14-06-2017(FN) 14-06-2017(AN)	<b>3. OpenCL Framework Fundamentals -2</b> Describes OpenCL framework components such as the OpenCL platform API, OpenCL run-time API, and OpenCL programming language.
5	15-06-2017(FN))	<b>4. Synchronization</b> Describes OpenCL synchronization techniques such as events, barriers, blocking write/read, and the benefit of using out-of-order execution.
6	16-06-2017(FN)	<b>5. Introduction to ND Ranges</b> Explains the basics of ND Range (N dimensional range) and the OpenCL execution model that defines how kernels execute with the ND Range definition. Functions
7,8	17-06-2017(FN) 17-06-2017(AN)	<b>6. Working with ND Ranges</b> Explains the host code and kernel code changes with respect to ND Range. Also explains how ND Range works and the best way to represent the work-group size for the FPGA architecture.
9	19-06-2017(FN)	<b>7. Profiling</b> Describes the different reports generated by the tool that help to optimize data transfer and kernel optimization.
10,11	20-06-2017(FN) 20-06-2017(AN)	<b>8. Debugging</b> Explains the support for debugging host code and kernel

		code as well as tips to debug the system.
12	21-06-2017(FN)	<b>9. Optimization Methodologies</b> Describes the recommended flow for optimizing an application in the environment.
13	22-06-2017(FN)	<b>10. Memory Transfer Optimization Techniques</b> Describes the various optimization techniques for data transfer between kernels and global memory.
14,15	23-06-2017(FN) 23-06-2017(AN)	<b>11. Kernel Optimization Techniques</b> Apply different techniques such as loop unrolling, pipelining, and DATAFLOW
16,17	24-06-2017(FN) 24-06-2017(AN)	<b>12.Using the RTL Kernel Wizard to Reuse Existing IP as Accelerators</b> Describes how the environment provides RTL kernel developers with a framework to integrate their hardware functions into an application running on a host PC connected to an FPGA via a PCIe interface.

  
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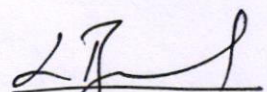


Course on Accelerating C, C++, Open Cl & RTL Application  
Date of Introduction of the Course: 24.06.20217

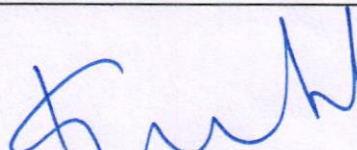
**School of Computing**  
**Registered Students Name List**

S.NO	REG.NO	NAME OF THE STUDENT
1	U17CS024	GANDHAM VENKATATESWARA RAO .
2	U17CS025	DEME VAMSHI KRISHNA .
3	U17CS026	JONNAGADDALA PAVAN KUMAR NAIDU .
4	U17CS027	MANI SHANKAR G
5	U17CS028	DEEPIKA R
6	U17CS029	GONE ESHWAR MANI SAI .
7	U17CS030	MOGALI NAGENDRA SAI CHARAN TEJ
8	U17CS132	MOHAMED IMRAN NAZEER K
9	U17CS133	MAHESWARAPU REVANTH CHANDRA SEKHAR .
10	U17CS134	RAJEEV RANJAN
11	U17CS135	KANCHANAPALLI SAI LAKSHMANA RAJU .
12	U17CS136	THUVAPALLI SAIKUMARREDDY
13	U17CS137	JANAPAREDDY SRIRAM
14	U17CS138	KONDAKINDI SHASINDER REDDY .
15	U17CS139	BELLAMKONDA SANTHOSH
16	U17CS140	TANGUTURI VENKA SAI PAVAN KUMAR
17	U17CN024	MALLEPAKA SRI VARSHITH .
18	U17CN025	KONDRA SRINU
19	U17CN026	PODAMEKALA VAMSIKRISHNA
20	U17CN027	MUDRAKOLA SAITEJA
21	U17CN028	ONTEDDU DHANA LAKSHMI .
22	U17CN029	GARIKIPATI NAGA SIVA DORA .
23	U17CN030	MARUKURTI ANIL
24	U17CN031	JAIRUS HOLSON J
25	U17CN033	JADAV BAL CHARAN .
26	U17CN034	KOMMARAJULA PRAVEEN KUMAR .
27	U17CN035	SAMSUNDAR S
28	U17CN036	MANDATI RATHNAKAR
29	U17CN037	KARRA NAGARAJU
30	U17CS053	GASI VENU GOPAL .
31	U17CS054	BELLAMKONDA KRISHNA VIVEK .
32	U17CS055	BELLAMKONDA VENKATA SIVA SAI MANIKANTA
33	U17cs056	DODDA ANUSHA
34	U17CS057	BOLLA SAI PRAKASH .

35	U17CS058	BANDARI RANJITH REDDY .
36	U17CS059	REKAPALLISASAANK .
37	U17CS060	KONKALA GURU PAVAN KUMAR .
38	U17CS061	AVINASH REDDY THIYYAGURA .
39	U17CS062	YANAMANDALA KAMALAKARA NAVEEN .
40	U17CS063	SHAIK AFREED
41	U17CS064	NIRMALA DEVI S
42	U17CS707	ABHIJEET SINGH
43	U17CN038	NAKKANI SIVATEJA
44	U17CN039	KANTHETI MONI PRASAD .
45	U17CN040	VIKRAM DEV SAHU .
46	U17CN041	MEKALA LAKSHMI NARAYANA .
47	U17CN042	MUKKU MADHAVA REDDY .



COURSE COORDINATOR



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# Bharath UNIVERSITY

பாரத் பல்கலைக்கழகம்

BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

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## CERTIFICATE OF PARTICIPATION



# Ms.A.Sangeetha

For actively participating in the value added course “**Accelerating C,C++,  
Open CI & RTL Application**” Conducted by School of Computing, BIHER  
from 12.06.2017 to 24-06-2017.

Course Coordinator

Head of the Department

Director

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**CERTIFICATE COURSE ON ACCELERATING C, C++, OPEN CL & RTL APPLICATION**

**Introduction of the Course: 24.07.2017**



**Course Coordinator**

**Head of the Department**

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## COURSE FEEDBACK FORM

Academic Year		2017-2018								
Term		Term 2								
Course Number										
Course Title		Accelerating C, C++, Open Cl & RTL Application								
Number of Credits										
Type of Course	Regular		Elective		Add-on				<input checked="" type="checkbox"/>	
<b>I. Information on the Respondent: (Tick (✓) Appropriately)</b>										
1. Percentage of classes attended										
	0-20		20-40		40-60		60-80		80-100	<input checked="" type="checkbox"/>
2. Number of hours per week spent on the course (Other than lecture hours)										
	0-2		2-4		4-6		6-8	<input checked="" type="checkbox"/>	8-10	
3. Preparation for the course by the student:										
(i)	Have done part of this course earlier									
(ii)	Has adequate prior exposure to the prerequisites									
(iii)	Had to pickup relevant additional topics through concurrent study <input checked="" type="checkbox"/>									
(iv)	Have no exposure to the background material									
4. The expectations for taking the course by the student are:										
(a)	Enhance by skill base in the area of specializations									
(b)	Get exposed to a relevant subject <input checked="" type="checkbox"/>									
(c)	Curiosity									
(d)	Better Employment Opportunity <input checked="" type="checkbox"/>									
(e)	Complete Course requirements									
(f)	To Improve CGPA									
<b>About the Instructor: Information on the Respondent: (Tick (✓) Appropriately)</b>										
		A	B	C	D	E				
1.	Pace of the Teaching/lecture		<input checked="" type="checkbox"/>							
2.	Comment of the Subject	<input checked="" type="checkbox"/>								
3.	Clarity of expression		<input checked="" type="checkbox"/>							
4.	Level of preparation	<input checked="" type="checkbox"/>								
5.	Level of interaction	<input checked="" type="checkbox"/>								
6.	Accessibility outside the class		<input checked="" type="checkbox"/>							
7.	Others (please specify)	<input checked="" type="checkbox"/>								
<b>A: Excellent</b>		<b>B: Very Good</b>		<b>C: Good</b>		<b>D: Satisfactory</b>		<b>E: Poor</b>		

  
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<b>I. Information on the Respondent: (Tick (√) Appropriately)</b>									
<b>1. Percentage of classes attended</b>									
0-20		20-40		40-60	<input checked="" type="checkbox"/>	60-80	80-100		
<b>2. Number of hours per week spent on the course (Other than lecture hours)</b>									
0-2		2-4		4-6		6-8	<input checked="" type="checkbox"/>		
<b>3. Preparation for the course by the student:</b>									
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(iii)	Had to pickup relevant additional topics through concurrent study <input checked="" type="checkbox"/>								
(iv)	Have no exposure to the background material								
<b>4. The expectations for taking the course by the student are:</b>									
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(b)	Get exposed to a relevant subject <input checked="" type="checkbox"/>								
(c)	Curiosity <input checked="" type="checkbox"/>								
(d)	Better Employment Opportunity <input checked="" type="checkbox"/>								
(e)	Complete Course requirements <input checked="" type="checkbox"/>								
(f)	To Improve CGPA								
<b>About the Instructor: Information on the Respondent: (Tick (√) Appropriately)</b>									
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>			
1.	Pace of the Teaching/lecture	<input checked="" type="checkbox"/>							
2.	Comment of the Subject	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
3.	Clarity of expression		<input checked="" type="checkbox"/>						
4.	Level of preparation	<input checked="" type="checkbox"/>							
5.	Level of interaction		<input checked="" type="checkbox"/>						
6.	Accessibility outside the class	<input checked="" type="checkbox"/>							
7.	Others (please specify)		<input checked="" type="checkbox"/>						
<b>A: Excellent</b>		<b>B: Very Good</b>		<b>C: Good</b>		<b>D: Satisfactory</b>		<b>E: Poor</b>	

*[Signature]*  
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