CHETHAN RAMAKRISHNA REDDY (PREFFERED NAME – CHETHAN)

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OBJECTIVE - To contribute my skills in an engineering research and product development environment and have a relation of mutual passion and benefit.

EDUCATION

Degree	<u>University</u>	School/College	Specialization	<u>Year</u>	Percentage/Grade
SSLC	Karnataka Secondary	Shree Cauvery High		2005	87.84%
(Secondary	Education Examination	School, Bangalore,			
School	Board, Government of	Karnataka, India			
Leaving	Karnataka, India				
Certificate)					
2nd year	Department of Pre-	St. Joseph's Pre-	PCME (Physics,	2007	78.33%
Pre-	University Education,	University College,	Chemistry, Mathematics,		
University	Government of	Bangalore, Karnataka,	Electronics)		
College	Karnataka, India	India			
Bachelor of	Visvesvaraya	New Horizon College	Mechanical Engineering	2007-	73.18%
Engineering	Technological	of Engineering,		2011	
(BE)	University, Belgaum,	Bangalore, Karnataka,			
(<u>Link</u>)	Karnataka, India	India			
Master of	National Institute of	National Institute of	Mechatronics	2011-	8.37 cgpa on a
Technology	Technology Karnataka	Technology Karnataka	Engineering	2013	scale of 10
(MTech)	(NITK), Surathkal,	(NITK), Surathkal,			
(<u>Link</u>)	India	India			
Doctoral	Michigan	Michigan	Mechanical Engineering	2016-	3.85 cgpa on a
Research	Technological	Technological	 Engineering Mechanics 	Present	scale of 4 (So far)
(Ph.D.)	University (MTU),	University (MTU),	(ME-EM)		
	USA	USA			

ACADEMIC DETAILS

Ph.D. | MTU

- 1. Fall 2016 (Aug 2016 Dec 2016) Key courses¹:
 - Introduction to Propulsion Systems for Hybrid Electric Vehicles Hybrid electric vehicle analysis will be developed and applied to examine the operation, integration, and design of powertrain components. Model based simulation and design is applied to determine vehicle performance measures in comparison to vehicle technical specifications. Power flows, losses, energy usage, and drive quality are examined over drive-cycles via application of these tools. GPA 4/4
 - Internal Combustion Engines II Advanced topics in internal combustion engines with emphasis on CI operation, modeling of engines, modeling of combustion processes, tribology, second law applications, and other topics of current interest. GPA 3.5/4

¹ MTU Course Description

- Principles of Energy Conversion Introduces background, terminology, and fundamentals of energy
 conversion and storage. Discusses current and emerging technologies for production of thermal,
 mechanical, and electrical energy. In-depth analysis of major thermodynamic power cycles. Topics include
 fossil and nuclear fuels, thermodynamic power cycles, solar energy, wind energy, and energy storage.
 GPA 4/4
- 2. Spring 2017 (Jan 2017 April 2017) Planned Key courses²:
 - Advanced Propulsion Systems for Hybrid Electric Vehicles Hybrid electric vehicles (HEV) will be
 studied and simulated using advanced powertrain component analysis and modeling. An in-depth analysis
 and study of power flows, losses and energy usage are examined for isolated powertrain components and
 HEV configurations. Simulation tools will be developed and applied to specify powertrain and vehicle
 components and to develop control and calibration for a constrained optimization to vehicle technical
 specifications.
 - Engineering Research Communications Guides students through the process of publishing research in technical journals and presenting research at conferences and other venues, with a focus on practical application of rhetorical concepts. Students will prepare papers and presentations related to their own research.
 - *Distributed Embedded Controls* This course will develop an understanding for the design and application of embedded control systems. Topics to be covered include: embedded system architecture, model-based embedded system design, real-time control, communication protocols, signal processing, and human machine interface. Embedded applications in advanced hybrid electric vehicles will also be introduced.

MTech | NITK

- 1. Mini Project: Rotary encoder using 8051 micro controller
 - Aim of the project was to reduce the cost of available Rotary encoders
 - An incremental rotary encoder was designed and built using a stepper motor
 - Every step by the stepper motor gave a pulse, which was amplified and fed into the micro controller
 - The micro controller was programmed to show the angle turned by the stepper motor by an LED and an LCD display
- 2. Practical Training at Robert Bosch Engineering & Business Solutions Private Limited, India (RBEI)
 - Built a Stepper Motor interface model (MATLAB/Simulink environment) as an Idle Air Control Actuator for a Fuel Injected Gasoline I.C. Engine
 - Modeled and simulated a complete Air Intake system (including cylinder breathing dynamics) considering a Gasoline 2 cylinder Engine in MATLAB/Simulink environment.

Report Link

- 3. MTech project/thesis at Robert Bosch Engineering & Business Solutions Limited, India (RBEI) on Development of Automotive Thermoelectric Generator (ATEG)
 - Aim of the project is to recover waste heat energy from exhaust of an Internal Combustion (IC) engine driven Automobile and convert a part of it to electricity (useful form of energy) by the thermoelectric or Seebeck effect.
 - Project involved a detailed simulation model built in MATLAB/Simulink environment, model validation
 by giving the model inputs from the engine test bench data (measurements) and an overview on the control
 strategy to realize ATEG.
 - Future activities involve demonstration of Waste Heat Recovery by thermoelectric generator on a test vehicle.

Thesis link

² MTU Course Description

BE | **New Horizon College of Engineering**

Final semester project:

- 1. Design and Fabrication of Boundary Layer Turbine as a Potential Automotive engine (Compressed Air as Fuel):
 - Based on invention by Nikola Tesla in early 20th century
 - The project involved design and analysis of a rotary boundary layer turbine to drive an automobile
 - This was a low torque engine which could rotate at speeds towards the fluid inlet velocity
 - Compressed air was used (upwards of 10 bar) and the engine output was tested at each input fluid pressure
 - The problem of low torque was tackled by inletting compressed air at a high velocity so that the shaft output speed was high (rpm), the engine shaft was then geared down at the wheels to maintain sufficiently high torque
 - Storage of compressed air fuel required a very large tank to obtain a reasonable range
 - The solution proposed was to have an on-board compressor which kicked in at a threshold rpm (when the engine has enough power to drive the compressor and the automobile), thus increasing the range for smaller storage tanks.

Thesis link

WORK EXPERIENCE

<u>Organization</u>	Duration	Role	
Robert Bosch Engineering and Business	4 June 2012 to 29 March	Project Intern (<u>Certificate</u>)	
Solutions Limited (RBEI), Bangalore, Karnataka,	2013 – approx. 10 months		
India			
Robert Bosch Engineering and Business	19 August 2013 to 30	Engineer– Modeling and System	
Solutions Limited, Bangalore, Karnataka, India	September 2015	Simulation	
Robert Bosch Engineering and Business	1 October 2015 to 5	Senior Engineer– Modeling and System	
Solutions Limited, Bangalore, Karnataka, India	August 2016	Simulation (Relieving Letter) (Service	
		<u>Certificate</u>)	

WORK DETAILS

- 1. Internship Carried out my internship activities (two months), my master's project work and other tasks to assist my team and the organization overall.
- 2. Employee
 - 1. <u>HIL plant model development</u> A Hardware in Loop setup (HIL) contains a control model (to be tested in its target hardware) and a plant model. My role was in calibrating the plant model (in this case an Automobile) and also developing missing models, if any. MATLAB/Simulink was used calibrate, built, validate and generate code of the models.
 - 2. <u>Model based testing</u> The aim of this project is to develop control model in a simulation environment (MATLAB/Simulink) and then generate code out of it. We can do testing and validation (of the control logic), by Model in Loop testing (MIL integrating the control model with plant model and testing by feeding the model with standard test cases) and Software in Loop testing (SIL generating code out of the control model and integrating it with the same plant model and feed the co-simulation model with standard test inputs), in the development phase itself thus saving time and resources. I was responsible for all the technical implementation for this piloting project.
 - 3. <u>Model based design & calibration</u> There are two aims with this project, they are
 - i. Built highly accurate plant models and use it to pre calibrate the Maps/Tables in an Electronic Control Unit (ECU)
 - ii. Built highly accurate plant models and use it to make design decisions (for egs: how big a component is required? How best to connect it? etc.)

The obvious outcome of this project is lesser dependency on Test Bench, faster time to market; leading to cost savings. The project is carried out in GT-Suite and MATLAB/Simulink.

- 4. <u>Virtual hardware</u> The aim of this project is to be able to model/simulate the whole embedded system in a PC environment. That includes a very accurate microcontroller model (purchased for microcontroller manufacturers), ASIC models (usually the electrical drivers), control model (software which sits inside the microcontroller) and plant model (to give various sensor and receive actuator signals from the control model). The use case of such a pilot project is huge and will benefit the organization in time, money and resources. My role was to completely develop and validate the plant model. This included calibrating the model to the particular use case, develop missing models and validate the same with integrating with the rest of the system. MATLAB/Simulink was used to develop, calibrate and generate code out of the model.
- 5. Active Noise Cancellation and Enhancement This is the most innovative and challenging project I have ventured into so far. The aim is to develop a product for automobiles (two wheelers, passenger cars, off road vehicles etc.) capable of cancelling or enhancing sound at the exhaust of the vehicle. This is achieved actively. So the idea is to cancel sound if the vehicle exhaust is too loud or enhance it to make a passenger car sound like a F1 car (for egs). I was responsible fully on the technical side right from vehicle noise measurement, mechanical setup of sensor and actuator to electronic control unit development. I was successfully able to develop two demonstrators on test vehicle (a two wheeler). One with a pure static analog hardwired solution for active noise cancellation and an adaptive software solution for cancellation/enhancement both (a switch to opt either of the two). The software tools I used for this project are MATLAB/Simulink and DSPACE MicroAutoBox 2 (rapid prototyping electronic control unit (ECU)).
- 6. Bosch Boost Recuperation System (BRS) Simulation BRS is an advance system for mild hybrid and CO₂ reduction by Bosch, one step ahead of conventional start/stop systems. It provides start/stop, coasting, brake recovery and also boosting using a controller and an electrical machine (acts as a motor and also generator) coupled to the Engine. BRS is typically a 48 Volt system (i.e. consisting of a 48 Volt electrical machine) in developed markets like the Europe and America but for emerging markets such as India a 12 Volt BRS (i.e. consisting of a 12 Volt electrical machine) is more appropriate, mainly due to cost and smaller Engines. So, my task was to develop both the control (mainly because control strategies for European and Indian market will be markedly different) and plant model to analyze the advantages of a 12 Volt BRS and 48 Volt BRS for Indian market and the different vehicle segments of the Indian market. One mort important task here was to validate the pros and cons of using a Supercapacitor/Ultracapacitor/Hybrid-Supercapacitor as an alternate ESS (Energy Storage System) to the Li-Ion Battery for Indian Market. This work was done partly in GT-Suite and partly in MATLAB/Simulink.
- 7. Automobile Waste Heat Recovery using thermoelectric generators This is mainly a self-initiation project. Mainly because I believe in this project and its business potential. In addition to the work I had done during my internship at Bosch, I have further built competency, interacted with a few thermoelectric generator manufacturers, studied use cases in the Automotive domain, demonstrated a use case on a two wheeler and pushing it as a product/solution viable in the market.

TECHNICAL SKILLS

- 1. Modeling/Simulation/Data Analysis in MATLAB/Simulink environment
- 2. Automobile Acoustics understanding (Basic to Intermediate level)
- 3. Automobile system understanding (Basic to Intermediate level)
- 4. Automotive Embedded Software Development Cycle Usage of Automated tool chain, eg. ETAS, DSPACE tool chain
- 5. Basics in Hardware in loop (HiL) testing (Automobile environment)
- 6. Basic knowledge of modeling in Automobile system simulation environments AVL BOOST, GT-SUITE

CERTIFICATION COURSES

1. Completed a practical and hands on course in Automobile Servicing and Maintenance in G.D. Naidu Charities, Coimbatore (Certificate)

Highlights:

- 1. Was a 3 week course on Automobile servicing and Maintenance
- 2. We were given all the typical Automobile parts (Engine, Clutch, Gear Box, Differential, Suspension, Steering, etc.).
- 3. These were stripped to most basic level and we learnt to service (clean) and re-assemble them
- 4. Was a very informative course, helped to understand all the parts of a typical Automobile, understand its realisation physically (after what I had learnt in theory in college) and appreciate their performance

2. Completed a familiarization course in H.A.L. Aircraft division (<u>Certificate</u>) Highlights:

- 1. Was a month long Training/Familiarization course in the H.A.L. Aircraft division plant in Bangalore, India
- 2. Each day we were assigned a department/shop to get to know and familiarize ourselves with what they are doing, which component of which Aircraft they are producing, number of employees etc
- 3. In the final week, we were assigned to Aircraft service bay and final assembly plants, where I got a chance to sit inside and explore Sukhoi, LCA (Light Combat Aircraft), Surya Kiran, Hawk (the then training and combat Aircrafts used by the Indian Air Force)

ACHIEVEMENTS

- 1. Demonstrated ANCE (Active Noise Cancellation and Enhancement) project on a two wheeler and was appreciated by many top level management/technical leads of our organization including the president of our organization (RBEI). Our project ANCE was covered by various media organisations (Link 1, Link 2, Link 3, Link 4, Link 5)
- 2. Took an active part in College fests at both Pre-University and Undergraduate level
- 3. Was the school captain in Class X

LANGUAGES KNOWN

- 1. English Business fluent English (Read, write & speak). Cleared TOEFL iBT (May 2015) with a score of 103/120 (Link)
- 2. Indian Languages known Telugu (mother tongue), Kannada, Hindi
- 3. German (Basic Conversation skills) 1A qualified (Link)

PUBLICATION

[1] Chethan R Reddy, Shrikantha S Rao, Vijay Desai, Karthikeyan Ramachadran – "Modeling of an Automotive ThermoElectric Generator (ATEG)." Volume 2 Issue 5 May 2013 in International Journal of Science and Research (IJSR). → (http://www.ijsr.net/archive/v2i5/IJSRON2013977.pdf)

INTERNATIONAL EXPERIENCE

Had been to Germany for a 2-week business visit to a sister company of our organization to learn/discuss about ANCE (Active Noise Cancellation and Enhancement) project.

PERSONAL DETAILS

Date of Birth: 14 December 1989

Sex: Male

Marital Status: Single Passport: H5362516 (India)

US VISA Class: F1

Personal Website: http://chethanreddy.com/