

Instruction Set Architecture for CS 3220 (Fall 2014)
Hadi Esmaeilzadeh

ADD	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	0000"}
SUB	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	0001"}
AND	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	0100"}
OR	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	0101"}
XOR	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	0110"}
NAND	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	1100"}
NOR	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	1101"}
NXOR	:	{FMT: "RD,RS1,RS2",	IWORD: "0000 RD	RS1	RS2	000000000000	1110"}
ADDI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	0000		Imm"}
SUBI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	0001		Imm"}
ANDI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	0100		Imm"}
ORI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	0101		Imm"}
XORI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	0110		Imm"}
NANDI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	1100		Imm"}
NORI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	1101		Imm"}
NXORI	:	{FMT: "RD,RS1,Imm",	IWORD: "1000 RD	RS1	1110		Imm"}
MVHI	:	{FMT: "RD,Imm",	IWORD: "1000 RD	0000	1011		ImmHi"}
LW	:	{FMT: "RD,Imm(RS1)",	IWORD: "1001 RD	RS1	0000		Imm"}
SW	:	{FMT: "RS2,Imm(RS1)",	IWORD: "0101 0000	RS1	RS2		Imm"}
F	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	0000"}
EQ	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	0001"}
LT	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	0010"}
LTE	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	0011"}
T	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	1000"}
NE	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	1001"}
GTE	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	1010"}
GT	:	{FMT: "RD,RS1,RS2",	IWORD: "0010 RD	RS1	RS2	000000000000	1011"}
FI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	0000		Imm"}
EQI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	0001		Imm"}
LTI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	0010		Imm"}
LTEI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	0011		Imm"}
TI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	1000		Imm"}
NEI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	1001		Imm"}
GTEI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	1010		Imm"}
GTI	:	{FMT: "RD,RS1,Imm",	IWORD: "1010 RD	RS1	1011		Imm"}
BF	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 0000	RS1	RS2		PCRe1"}
BEQ	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 0001	RS1	RS2		PCRe1"}
BLT	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 0010	RS1	RS2		PCRe1"}
BLTE	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 0011	RS1	RS2		PCRe1"}
BEQZ	:	{FMT: "RS1,Imm",	IWORD: "0110 0101	RS1	0000		PCRe1"}
BLTZ	:	{FMT: "RS1,Imm",	IWORD: "0110 0110	RS1	0000		PCRe1"}
BLTEZ	:	{FMT: "RS1,Imm",	IWORD: "0110 0111	RS1	0000		PCRe1"}
BT	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 1000	RS1	RS2		PCRe1"}
BNE	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 1001	RS1	RS2		PCRe1"}
BGTE	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 1010	RS1	RS2		PCRe1"}
BGT	:	{FMT: "RS1,RS2,Imm",	IWORD: "0110 1011	RS1	RS2		PCRe1"}
BNEZ	:	{FMT: "RS1,Imm",	IWORD: "0110 1101	RS1	0000		PCRe1"}
BGTEZ	:	{FMT: "RS1,Imm",	IWORD: "0110 1110	RS1	0000		PCRe1"}
BGTZ	:	{FMT: "RS1,Imm",	IWORD: "0110 1111	RS1	0000		PCRe1"}
JAL	:	{FMT: "RD,Imm(RS1)",	IWORD: "1011 RD	RS1	0000		ShImm"}

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```
// B is implemented using BEQ
BR    : {FMT: "Imm",          ITEXT: ["BEQ  R6,R6,Imm"]}

// SUBI is implemented using ADDI
SUBI   : {FMT: "RD,RS,Imm",    ITEXT: ["ADDI RD,RS,-Imm"]}

// NOT is implemented using NOR
NOT    : {FMT: "RD,RS",        ITEXT: ["NAND RD,RS,RS"]}

// BLT/BLE/BGT/BGE is implemented using LT/LE/GT/GE and BNE
BLT    : {FMT: "RS1,RS2,Imm",  ITEXT: ["LT   R6,RS1,RS2","BNE R6,Zero,Imm"]}
BLE    : {FMT: "RS1,RS2,Imm",  ITEXT: ["LE   R6,RS1,RS2","BNE R6,Zero,Imm"]}
BGT    : {FMT: "RS1,RS2,Imm",  ITEXT: ["GT   R6,RS1,RS2","BNE R6,Zero,Imm"]}
BGE    : {FMT: "RS1,RS2,Imm",  ITEXT: ["GE   R6,RS1,RS2","BNE R6,Zero,Imm"]}

// CALL/RET/JMP is implemented using JAL
CALL   : {FMT: "Imm(RS1)",      ITEXT: ["JAL  RA,Imm(RS1)"]}
RET    : {FMT: "",              ITEXT: ["JAL  R9,0(RA)"]}
JMP    : {FMT: "Imm(RS1)",      ITEXT: ["JAL  R9,Imm(RS1)"]}
```